6115-596-14

TM 5-6115-596-14

TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

FOR

GENERATOR SET: GASOLINE ENGINE DRIVEN, 4.2 KW, 150 AMP, 28V, DC

MODEL DC 4.2 - ORD/28 (6115-00-857-1397)

This copy is a reprint which includes current pages from Changes 1 through 3.

HEADQUARTERS, DEPARTMENT OF THE ARMY

20 JUNE 1980

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CHANGE }
NO. 3 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 12 May 1989

Operator's, Organizational, Direct Support and General Support Maintenance Manual

GENERATOR SET: GASOLINE ENGINE DRIVEN, 4.2 KW, 150 AMP, 28V, DC MODEL DC4-2 - ORD/28 (6115-00-857-1397)

and

Direct Support Maintenance, Starter Generator 12345177 (19207)

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2-9 and 2-10	2-9 and 2-10
3-1 and 3-2	3-1 and 3-2
4-17 and 4-18	4-17 and 4-18
A-1 and A-2	A-1 and A-2
B-7/B-8	B-7/B-8
C-1 and C-2	C-1 and C-2

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To be distributed in accordance with DA FOrm 12-25A, Operator, Unit, Direct Support and General Support Maintenance requirements for Generator Set, Gas Driven, 28V, DC, 150AMP, 4.2KW, (DC4.2-ORD/28)

TM 5-6115-596-14
C 2

CHANGE
No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 6 August 1982

Operator's, Organizational, Direct Support and General Support Maintenance Manual

GENERATOR SET: GASOLINE ENGINE DRIVEN, 4.2 KW, 150 AMP, 28 V, DC (MODEL DC 4.2 - ORD/28) (6115-00-857-1397)

TM 5-6115-596-14, 20 June 1980, is changed as follows:

1. Remove and insert pages as indicated below.

	Remove pages	Insert pages
Table of Contents	i and ii	i and ii
Chapter 1	1-1 thru 1-11/1-12	1-1 thru 1-17/1-18
Chapter 2	2-1 and 2-2	2-1 and 2-2
	2-5 and 2-6	2-5 and 2-6
Chapter 4	4-7 thru 4-14	4-7 thru 4-14.4
	4-27 thru 4-32	4-27 thru 4-32.2
	4-33 and 4-34	4-33 thru 4-34.2
	4-39 thru 4-41/4-42	4-39 thru 4-42
Chapter 5	5-1 and 5-2	5-1 and 5-2
	5-5 thru 5-8	5-5 thru 5-8
	5-17 thru 5-20	5-17 thru 5-20
	5-43 thru 5-46	5-43 thru 5-46.1/5-46.2
	5-49 thru 5-52	5-49 thru 5-52

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URGENT

TM 5-6115-596-14
C 1

CHANGE
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *30 October 1980*

Operator's, Organizational, Direct Support and
General Support Maintenance Manual

GENERATOR SET: GASOLINE ENGINE DRIVEN, 4.2 KW,
150 AMP, 28 V, DC (MODEL DC 4.2 - ORD/28)
(6115-00-857-1397)

TM 5-6115-596-14, 20 June 1980, is changed as follows:

1. Remove and insert pages as indicated below.

	Remove pages	Insert pages
Warning	a and b	a and b
Chapter 2	2-9 and 2-10	2-9 and 2-10
Chapter 4	4-3 thru 4-6	4-3 thru 4-6.1/4-6.2

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The Adjutant General

DISTRIBUTION:
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URGENT

WARNING

HIGH VOLTAGE

is used in the operation of this equipment.

DEATH
or severe burns

may result if personnel fail to observe safety precautions. Disconnect the battery negative cable before removing or installing components in any electrical panel or system. Before servicing any part of the power plant, be sure that it is not connected to another power plant that is operating. Do not service the power plant while it is connected for standby operation. Ground the ignitor plug or ignition unit before removal by grounding the high tension lead contact spring to the ignitor immediately upon removal of the lead.

WARNING

DANGEROUS FUMES

Clean all parts in a well-ventilated area. Avoid inhalation of solvent fumes and prolonged exposure of skin to cleaning solvent. Wash exposed skin thoroughly. Dry cleaning solvent (Fed. Spec. P-D-680 used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100° to 138°F. (38° to 59°C.).

WARNING

EXPLOSIONS AND DANGEROUS GASES

Do not fill fuel tank with fuel while engine is running or while engine is hot. Make metal-to-metal contact when filling fuel tank. Do not smoke or use open flame when filling tank. Operate engine in a well-ventilated location. Carbon monoxide is a deadly gas that is given off by a gasoline engine. It is odorless and tasteless. The first evidence of its presence is that the operator of the equipment ill have a headache or suffer from a feeling of dizziness.

WARNING

NOISE HAZARD

Operation of the equipment presents a noise hazard to personnel. The noise level exceeds the allowable limits for unprotected personnel. Wear ear muffs or ear plugs which were fitted by a trained professional.

WARNING

SAFETY PRECAUTIONS

Before working on engine components, disconnect spark plug assembly to prevent accidental starting.

DAMAGE

Damage to the equipment may result if personnel fail to observe safety precautions. If generator set is shut-down by the operation of a safety device, do not attempt to operate unit until the cause has been determined and eliminated.

FIRE HAZARD

Before each start up operation, inspect both drive keys, bushing, pulleys and belts for proper tightness and alignment. Check for a clearance of approximately 1/2 inch between each pulley assembly and the sidewall of fuel tank. A properly positioned drive key should not extend beyond end of its shaft.

Inspect drive belts for proper tightness and alignment after every 100 hours of continuous operation, or at least monthly during intermittent operation. If neither looseness nor misalignment is detected after six months (or 600 hours) of operation, further inspection may be performed on a six-month periodic basis. Any looseness of belts should be corrected on the organizational level, whereas any detection of looseness or misalignment of drive keys, bushings, or pulleys should be reported to Direct Support level for correction.

TM 5-6115-596-14

TECHNICAL MANUAL

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON, D.C. 20 June 1980

Operator's Organizational, Direct Support, And General Support Maintenance Manual

GENERATOR SET: GASOLINE ENGINE DRIVEN, 4.2 KW, 150 AMP, 28 V, DC (MODEL DC 4.2 — ORD/28) (6115-00-857-1397)

REPORT OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistake or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, U.S. Army Troop Support & Aviation Materiel Readiness Command, ATTN: DRSTS-MPSD, 4300 Goodfellow Boulevard, St. Louis, MO 63120. A reply will be furnished to you.

			Paragraph	Page
CHAPTER	1.	INTRODUCTION		
Section	I.	General Information	1-1	1-1
	II.	Equipment description and data	1-5	1-4
CHAPTER	2.	OPERATING INSTRUCTIONS		
Section	I.	Description and use of operator's controls and indicators	2-1	2-1
	II.	Preventive maintenance checks and services	2-11	2-8
	III.	Operation under usual conditions	2-13	2-12
	IV.	Operation and maintenance under unusual conditions	2-15	2-17
CHAPTER	3.	MAINTENANCE INSTRUCTIONS		
Section	I.	Lubrication instructions	3-1	3-1
	II.	Operator Troubleshooting	3-5	3-4
CHAPTER	4.	ORGANIZATIONAL MAINTENANCE INSTRUCTIONS		
Section	I.	Repair Parts, Special Tools, TMDE AND Support Equipment	4-2	4-1
	II.	Service Upon Receipt	4-5	4-2
	III.	Preventive Maintenance Checks and Services	4-6	4-2
	IV.	Troubleshooting Procedures	4-8	4-6
	V.	Engine Maintenance Procedures	4-11	4-15

			Paragraph	Page
CHAPTER	4.			
Section (Continued)	VI.	Fuel, Air Intake, and Exhaust System Maintenance Procedures	4-14	4-17
	VII.	Electrical System Maintenance Procedures	4-22	4-25
CHAPTER	5.	DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS		
Section	I.	Repair Parts, Special Tools, TMDE and Support Equipment	5-2	5-1
	II.	Service Upon Receipt	5-4	5-1
	III.	Preventive Maintenance Checks and Services	5-5	5-1
	IV.	Troubleshooting Procedures	5-6	
	V.	Engine Maintenance Procedures	5-9	5-9
	VI.	Fuel Tank Maintenance Procedures	5-12	5-14
	VII.	Starter-Generator Maintenance Procedures	5-16	5-18
	VIII.	Generator-Regulator Maintenance Procedures	5-27	5-44
	IX.	Preparation for Shipment and Storage	5-34	5-52
APPENDIX	A.	References		A-1
APPENDIX	B.	Maintenance Allocation Chart		B-1
APPENDIX	C.	Additional Authorization List		C-1
APPENDIX	D.	Expendable Supplies and Materials List		D-1
APPENDIX	E.	Torque Limits		E-1
INDEX				INDEX 1

CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

1-1. Scope.

a. This technical manual contains instructions for operation, organizational maintenance, and direct and general support maintenance of the Generator Set: Gasoline Engine Driven, 4.2 Kilowatt, 150 Amperes, 28 Volt, Direct Current (Model DC 4.2 -ORD/28), see figure 1-1 or 1-1.1. The instructions for direct support maintenance disassembly, cleaning, inspection, repair and assembly of the starter-generator are also used to repair starter-generator 12345177 (19207).

b. This equipment is provided as a Generator Set for:

(1) Carrier, Command Post, Light, Tracked, M577-2320-856-6624.

(2) Carrier, Command Post, Light, Tracked, M577A1-2320-056-6808.

The equipment also serves as a Starter-Generator for Carrier, Guided Missile Equipment, Self-Propelled, XM730-1450-930-8749 starter generator 12345177 is used in the Auxiliary Power Unit (P/N 12344934, NSN 2390-01-268-8229) for the M1/M1A1 Tank.

c. This manual is used for Generator Set, Serial numbers 929-001 thru 929-290 and 923-001 thru 923-553. Some figures are repeated using a .1 suffix following the original figure number. Where this occurs, the suffixed figure refers only to sets serial numbered 929-001 thru 929-290, whereas the non-suffixed corresponding numbered figure refers to sets serial numbered 923-001 thru 923-553. When a figure is unrepeated so only the non-suffixed figure appears, these figures are to be used for all sets.

1-2. Maintenance Forms and Records.

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, The Army Maintenance Management System (TAMMS).

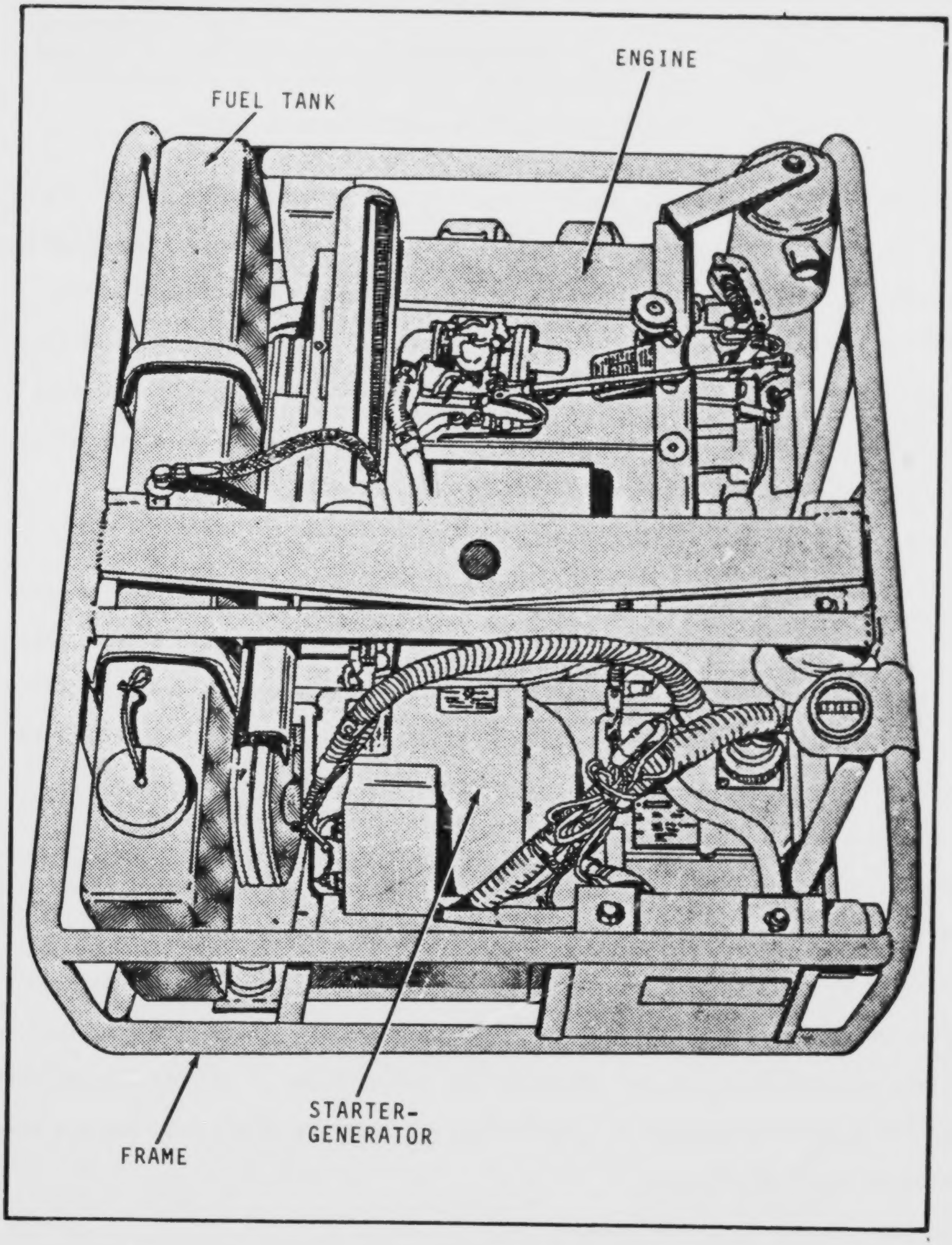

ENGINE
FUEL TANK
STARTER-
GENERATOR
FRAME

Figure 1-1. Generator set, 4.2 KW.

(Generator Sets serial numbers 923-001 thru 923-553)

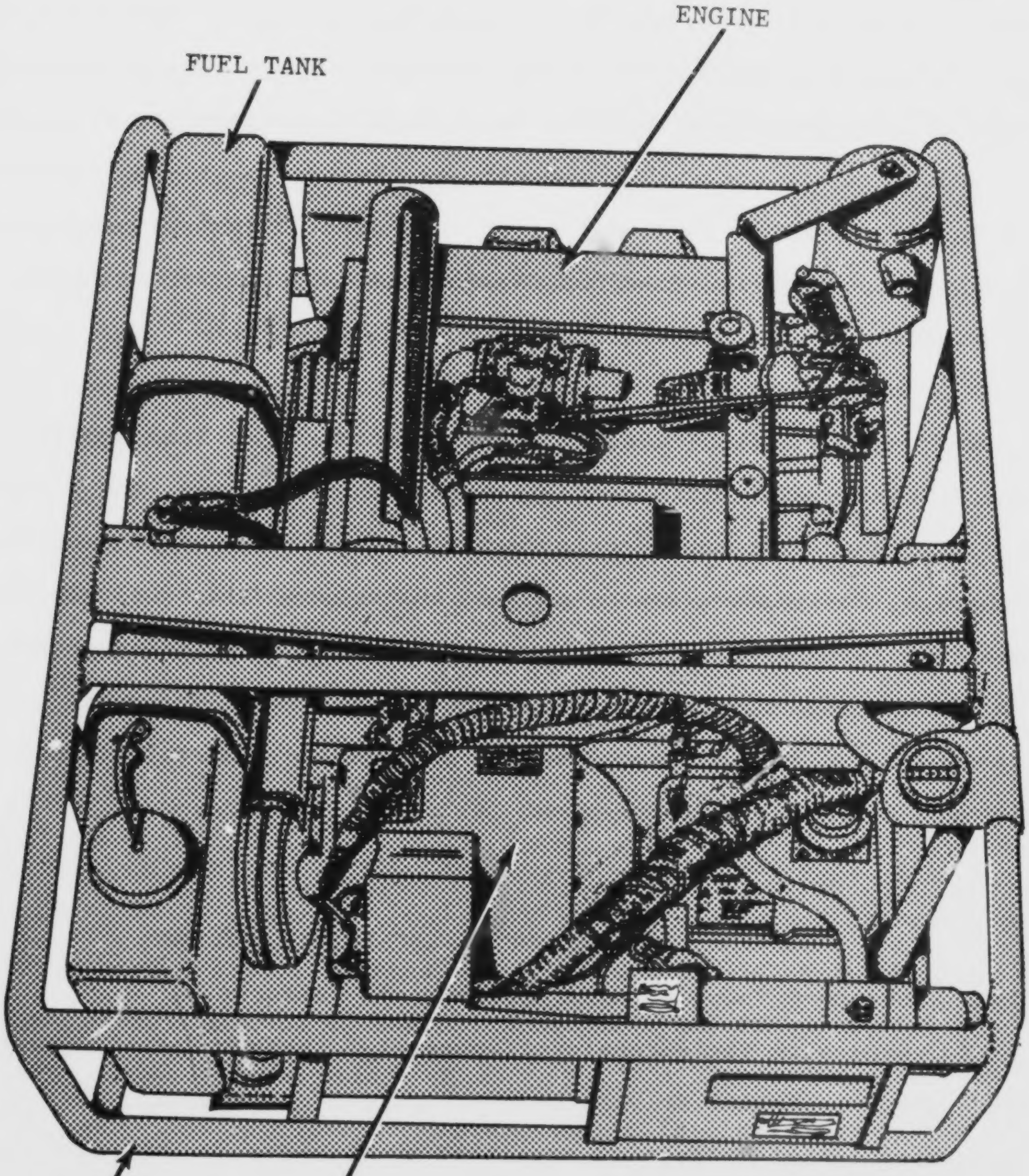

ENGINE
FUFL TANK
FRAME
STARTER GENERATOR

Figure 1-1.1 Generator set, 4.2kw.
(Generator Sets serial numbers 929-001 thru 929-290)

1-3. Reporting Equipment Improvement Recommendations.

EIRs can and must be submitted by anyone who is aware of an unsatisfactory condition with the equipment design or use. It is not necessary to show a new design or list a better way to perform a procedure, just simply tell why the design is unfavorable or why a procedure is difficult. EIRs shall be submitted on SF 368 (Quality Deficiency Report). Mail direct to Commander, US Army Troop Support and Aviation Materiel Readiness Command, ATTN: DRSTS-MPDM, 4300 Goodfellow Boulevard, Saint Louis, MO 63120.

1-4. Hand Receipts.

Hand receipts for the End Item/Components of End Item (COEI), Basic Issue Items (BII), and Additional Authorized List (AAL) items are published in a Hand Receipt Manual. The Hand Receipt Manual numerical designation is the same as the related Technical Manual with the letters HR added to the number. These manuals are published to aid in property accountability and are available through: Commander, US Army Adjutant General Publication Center, 2800 Eastern Boulevard, Baltimore, MD 21220.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-5. Equipment Purpose, Capabilities, and Features.

a. General. The generator (figures 1-2 through 1-4.1) consists of a gasoline engine driving a direct current generator. The generator output voltage is regulated by either a carbon pile voltage regulator (generator set serial numbers 923-001 thru 923-553) or a solid state voltage regulator (generator set, serial numbers 929-001 thru 929-290). The set is self-contained and can be started with a starting rope or an outside 24-voltage battery source. The engine, starter-regulator, and generator regulator mount on an inner frame, which is mounted to an outer frame with the fuel tank and control panel. The outside battery power source connects to the set through either of two power receptacles.

b. Definition of Locational Terms. The terms "left," "right," "front," and "rear" are used in this manual to designate areas of the generator set as viewed while standing at the control panel facing the set. The fuel tank is located on the left side of the set, the engine on the front side, the regulator on the right side, and the control panel on the rear side.

1-6. Location and Description of Major Components.

a. Engine. The engine is a four cylinder, air-cooled, horizontally opposed, overhead valve, gasoline engine capable of operating in temperate, desert, arctic, and tropic environments.

b. Starter-Generator. The starter-generator is a 28-volt, 8.4-kilowatt, 300-ampere, direct-current unit. For this application, the generator develops an output of 150 amperes and 4.2 kilowatts at 4,330 generator rpm. Bearings support the armature shaft by a pulley. The outer end of the shaft mounts a fan for self-air-cooling of the generator.

c. Generator Regulator. (Generator Set, serial numbers 923-001 thru 923-553). The generator-regulator is rated 150-400 amperes, 24 to 28 volts, direct current, and consists of two main components: a carbon pile voltage regulator and a cutout

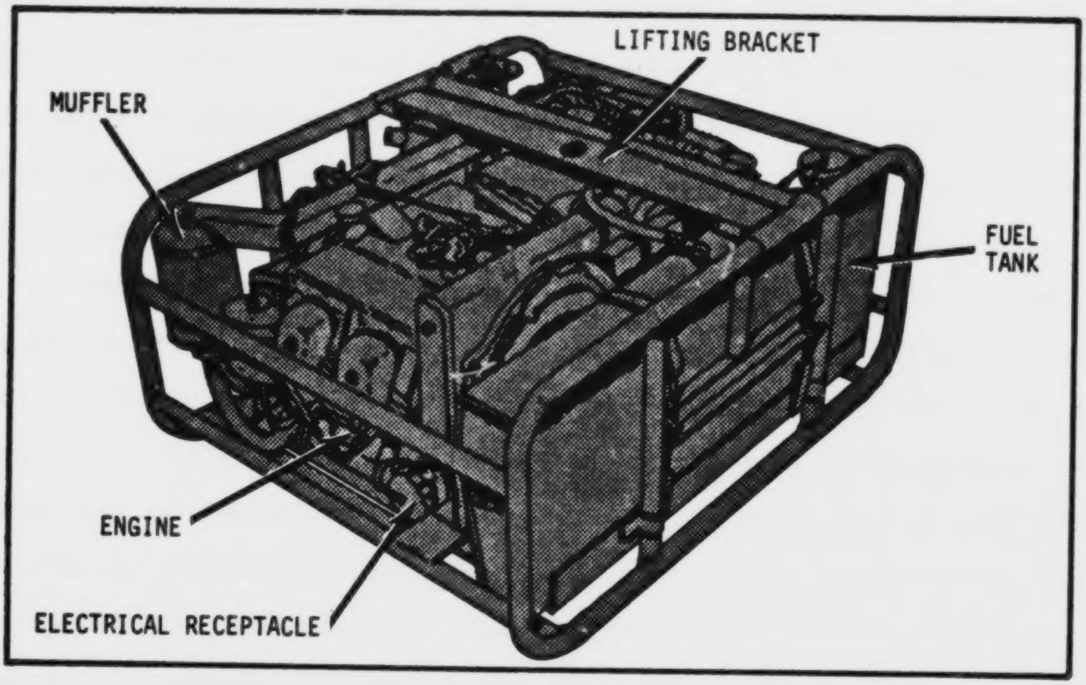

LIFTING BRACKET
MUFFLER
FUEL TANK
ENGINE
ELECTRICAL RECEPTACLE

Figure 1-2. Generator set - left front view.

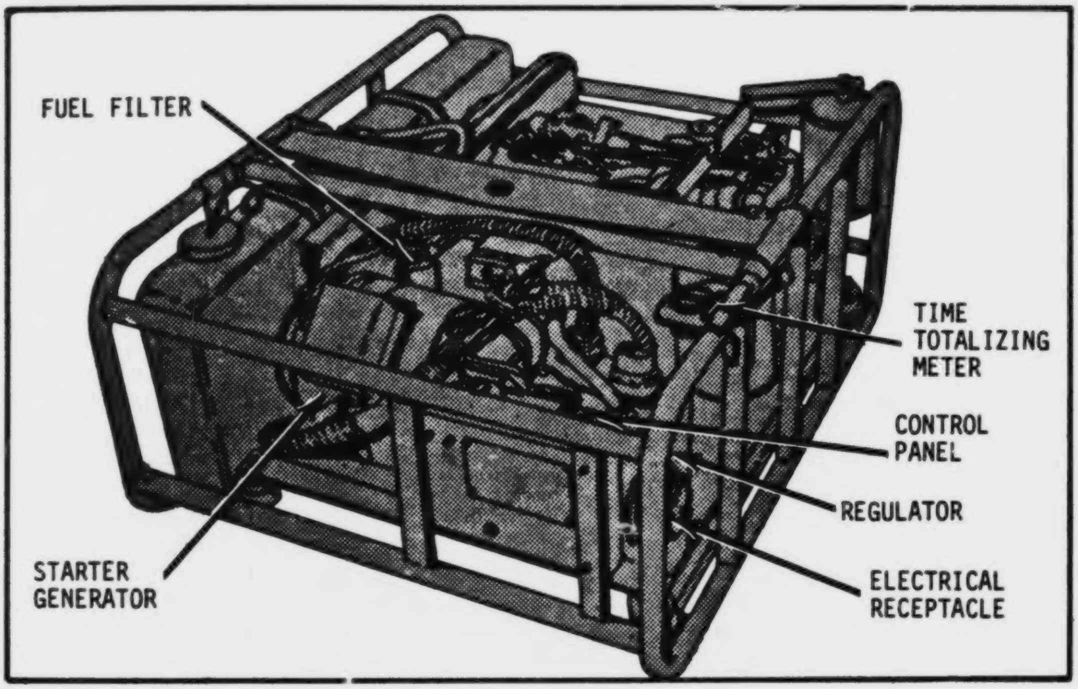

FUEL FILTER
TIME TOTALIZING METER
CONTROL PANEL
REGULATOR
ELECTRICAL RECEPTACLE
STARTER GENERATOR

Figure 1-3. Generator set - right rear view.

(Generator Sets serial numbers 923-001 thru 923-553)

relay assembly, both housed in a water-tight box. The box also contains relays, coils, and fixed and variable resistors.

c.1. Generator Regulator. (Generator Set, serial numbers 929-001 thru 929-290). The generator-regulator module is of solid-state design rated for 28Vdc (nominal) and a power output capability ranging from 4.2kw (module temperature equal to or less than 75 degrees F) down to 3kw (module temperature above 75 degrees F). Included in the regulator is an automatic overvoltage cutout capability. When the overvoltage condition is corrected, the regulator output voltage is restored by depressing the reset button mounted on the module. The unit is sealed and nonrepairable. The earlier units (paragraph 1-6c) contained a rheostat which acted as a limited voltage adjust. The rheostat has been eliminated with the introduction of the solid state regulator. A decal located in place of the rheostat explains the output voltage is non-adjustable.

d. Fuel System. The fuel system consists of a fuel tank, fuel filter, shutoff valve, carburetor, fuel pump, and interconnecting fuel lines. The fuel shutoff valve stops the fuel flow and can change the source of the fuel from the tank to an outside source.

e. Control Panel Assembly. The control panel is the mounting bracket for the engine start switch, voltage adjusting rheostat (present only in generator set, serial numbers 923-001 thru 923-553), starting relay, and receptacle for connecting the battery power source and generator output load.

e.1. Regulator Decal. (Generator Set, serial numbers 929-001 thru 929-290). This decal provides the installation date of the regulator and pertinent information on the device.

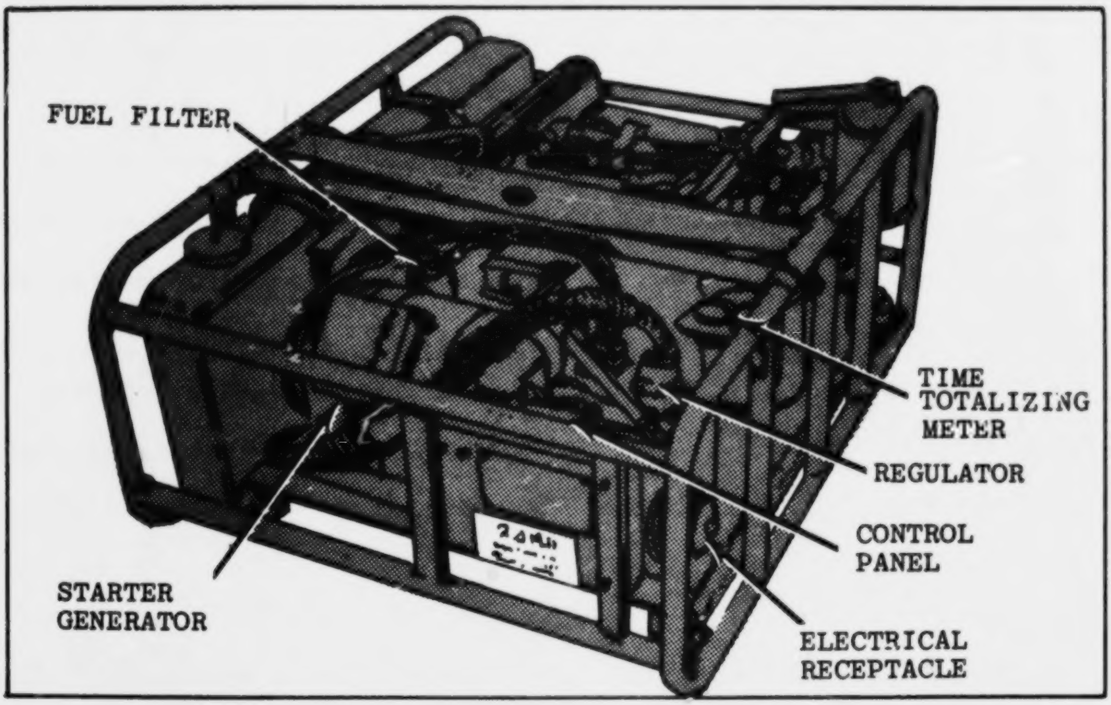

FUEL FILTER
TIME TOTALIZING METER
REGULATOR
CONTROL PANEL
ELECTRICAL RECEPTACLE
STARTER GENERATOR

Figure 1-3.1 Generator set - right rear view.

(Generator Sets serial numbers 929-001 thru 929-290)

f. Time Totalizing Meter. The time totalizing meter records the generator set operating time in hours.

1-7. Identification Plates and Signs (fig. 1-5 or 1-5.1).

a. General. Figures 1-5 and 1-5.1 locate and illustrate the identification plates and signs used on the major components of the generator set.

b. Generator Set Name Plate. The generator set name plate, mounted to the control panel at the rear of the generator set, provides name, serial number, and general information on the set.

c. Engine Name Plate. The engine name plate, located at the top of the engine, provides name, serial and federal stock numbers, and pertinent information on the gasoline engine.

d. Starter-Generator Name Plate. The starter-generator name plate, secured to the top of the starter-generator, furnishes name, serial number, output data, and other general information on the starter-generator.

e. Generator Regulator Name Plate. (Generator Set, serial numbers 923-001 thru 923-553). The generator regulator name plate provides the name, serial number, pertinent information on the regulator.

1-8. Equipment Description and Data.

a. General.

Model	19207-10919300
Weight (without fuel)	245 lb. (112.30kg)
Length	36 in. (91.44cm)
Height	16 in. (40.64cm)
Width	29 in. (73.66cm)

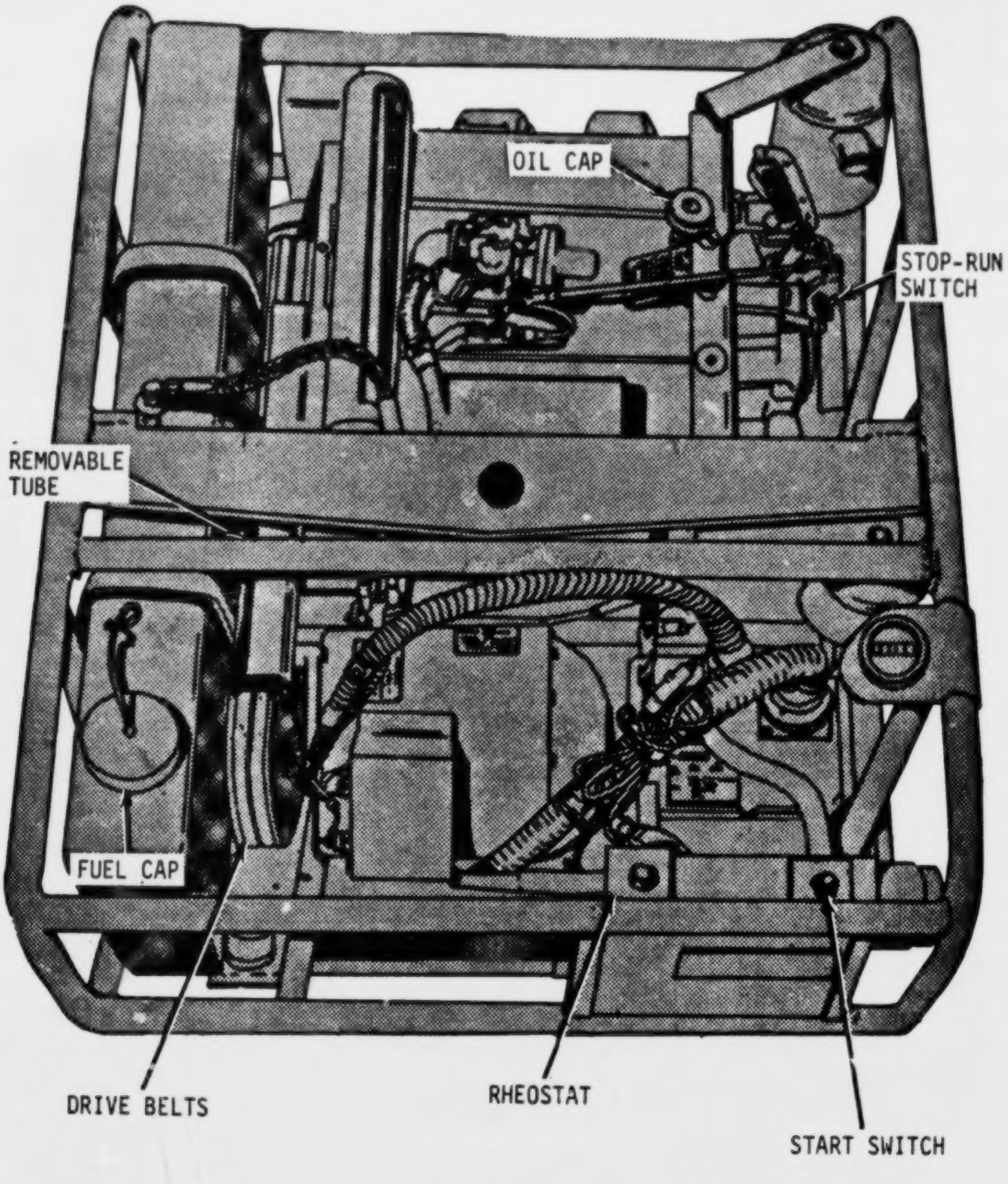

OIL CAP
STOP-RUN SWITCH
REMOVABLE TUBE
FUEL CAP
DRIVE BELTS
RHEOSTAT
START SWITCH

Figure 1-4. Generator set - top view.

(Generator Sets serial numbers 923-001 thru 923-553)

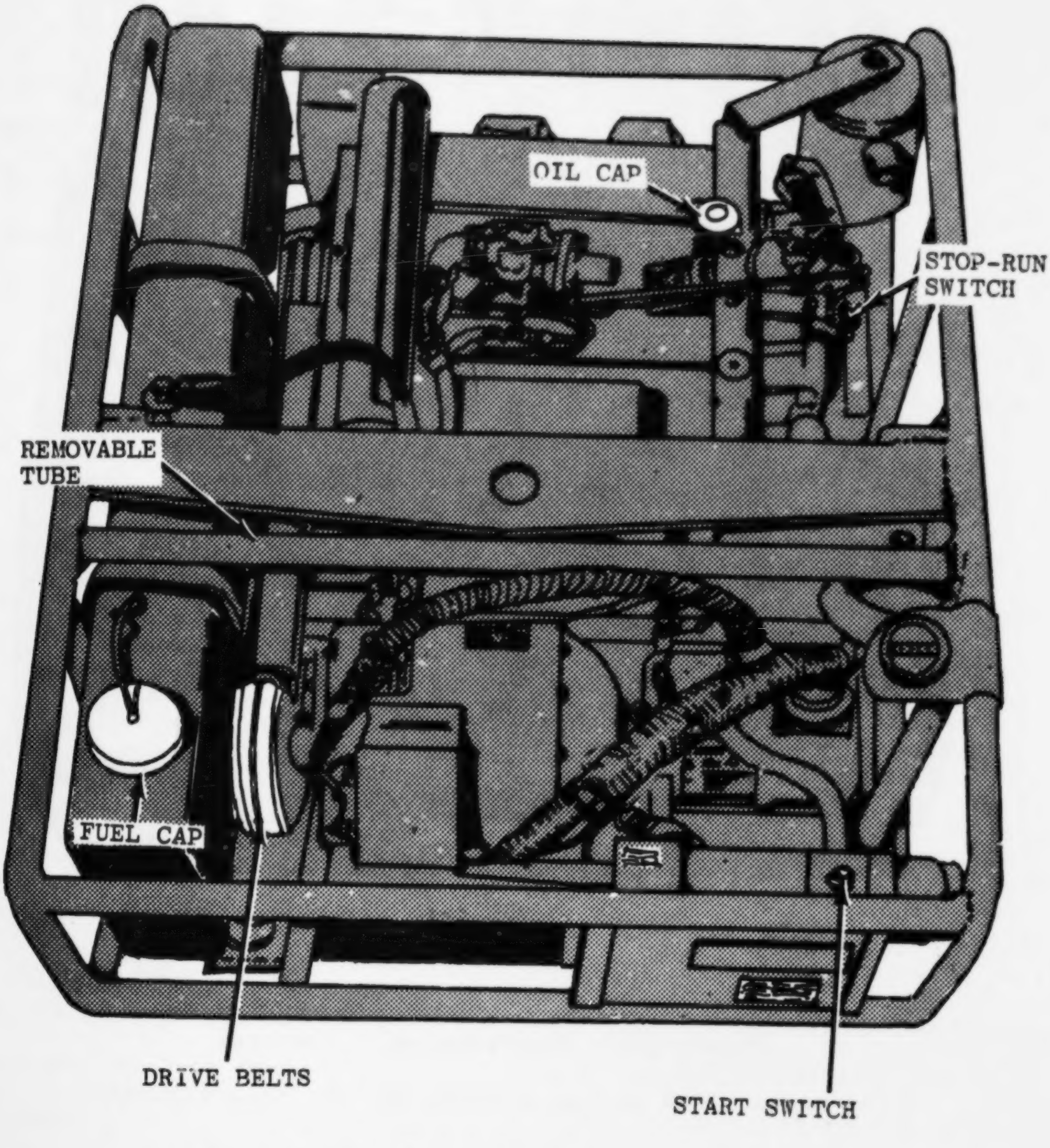

OIL CAP
STOP-RUN SWITCH
REMOVABLE TUBE
FUEL CAP
DRIVE BELTS
START SWITCH

Figure 1-4.1 Generator set - top view.

(Generator Sets serial numbers 929-001 thru 929-290)

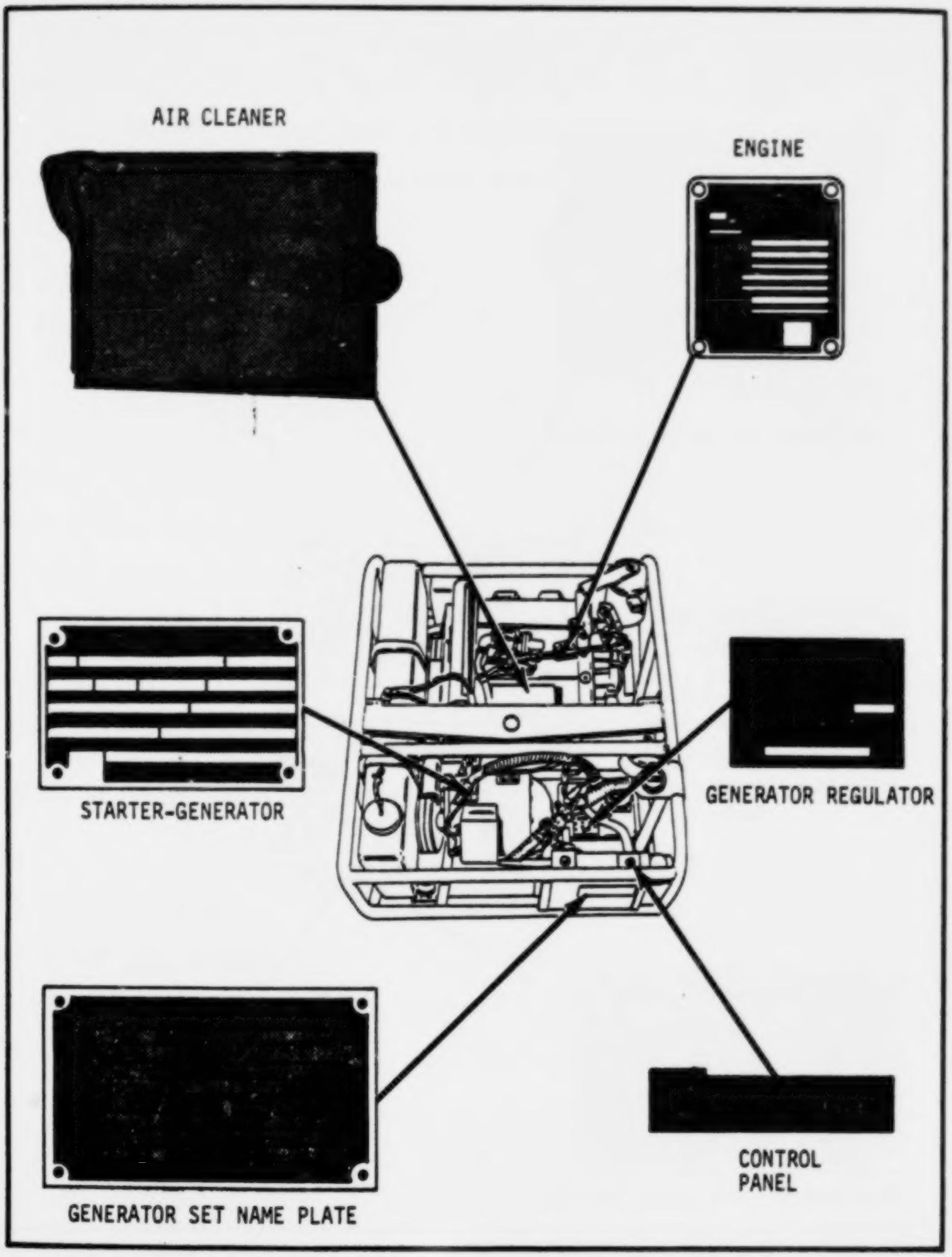

AIR CLEANER
ENGINE
STARTER-GENERATOR
GENERATOR REGULATOR
GENERATOR SET NAME PLATE
CONTROL
PANEL

Figure 1-5. Identification plates and signs.
(Generator Sets serial numbers 923-001 thru 923-553)

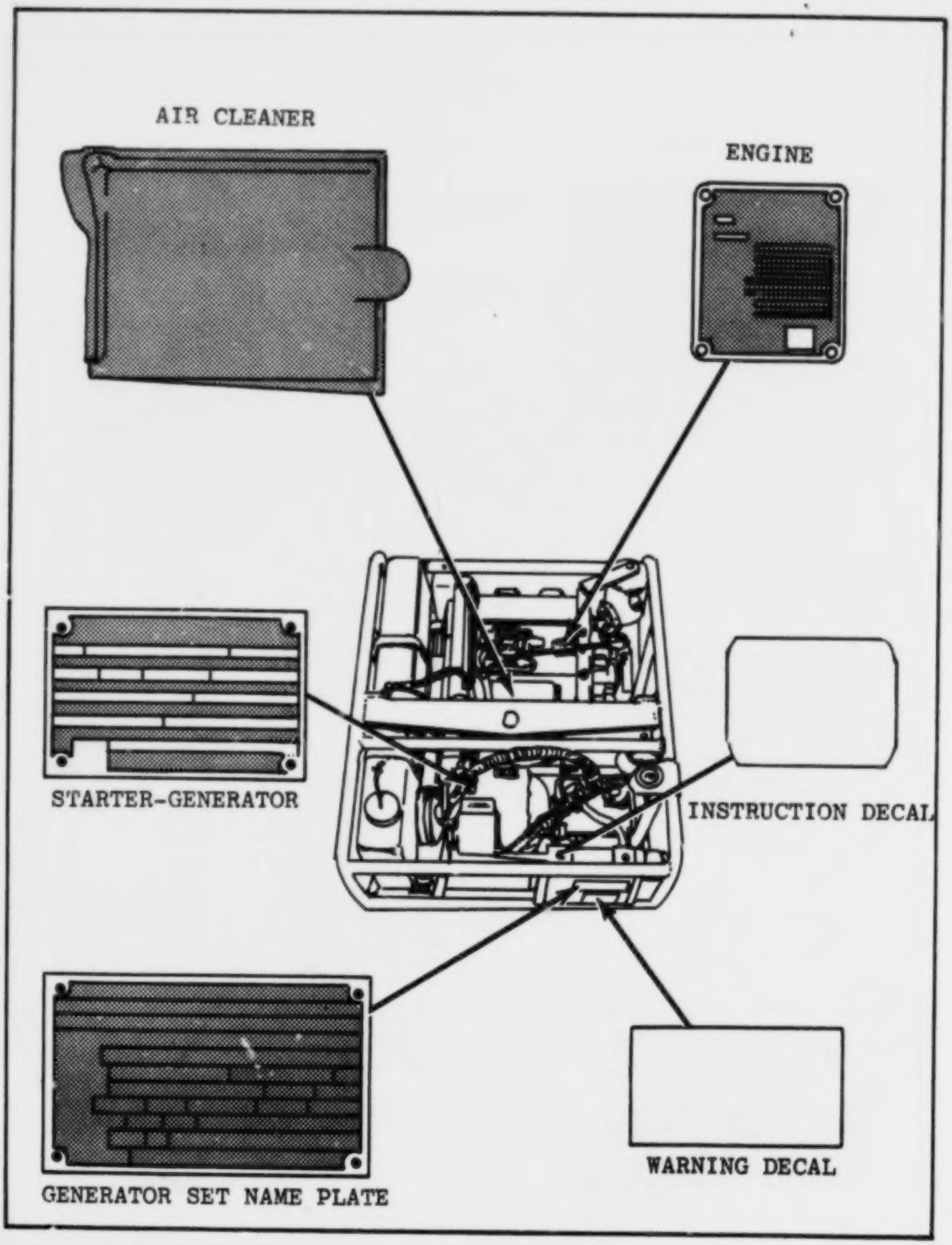

AIR CLEANER
ENGINE
STARTER-GENERATOR
INSTRUCTION DECAL
GENERATOR SET NAME PLATE
WARNING DECAL

Figure 1-5.1 Identification plates and signs.

(Generator Sets serial numbers 929-001 thru 929-290)

b. Performance.

Engine governed speed	3,600 rpm
Generator speed (at engine governed speed)	4,500 rpm
Generator output (at engine governed speed)	150 amp
Operating time (at 150-amp load)	8 hr

c. Capacities.

Engine crankcase	2-1/8 qt (2.01 liters)
Filter	1/2 qt (0.4732 liter)
Fuel tank	6 gal. (22.71 liters)
Fuel type:	
Motor method	83 octane
Research method	91 octane

d. Engine.

Military standard:	
Model	4A032-1
Type	4-cycle, gasoline, overhead valve, air cooled
NSN	NSN 2805-00-776-0483
Number of cylinders	4
Firing order (by cylinders)	1-4-2-3
Cylinder numbering (viewed from starter rope pulley):	
Left bank	1-3
Right bank	2-4
Bore	2.250 in. (5.715 cm)
Stroke	2.0 in. (5.08 cm)
Piston displacement	31.80 cu in. (521 cc)
Compression ratio	6.0 to 1
Horsepower (at governed speed, 3,600 rpm)	6

Maximum horsepower for intermittent duty....6.0 hp

Compression pressure................90-100 psig

Spark plugs 96906-MS51009-1

Gap................................... ....0.025 in. (0.635mm)

Valve lash clearance-hot.........................0.014 in. (0.355mm)

Magneto point gap................................0.018 in. (0.457mm)

e. Generator.

Rated kilowatts..................................8.4 kw

Loaded (continuous amperes at 4,500 to
6,500 rpm generator speed).....................300 amp

Voltage (direct current..........................24-30 v (generator)
serial numbers 923-001 thru 923-553)
....28 v nominal
(generator serial numbers 929-001 thru 929-290)

Weight (dry).....................................75 lb. (34.02 kg)

Terminal designation:

Positive.......................................B

Negative.......................................E

Equalizer winding..............................D

Field positive.................................A

Weight...52 lb. (23.6 kg)

f. Generator Regulator. (Generator Set, serial numbers 923-001 thru 923-553).

Model..96906-MS51005-1

Type...Carbon pile

Rated volts......................................24v-28v

Rated amperes....................................150-400 amp f.1. Generator Regulator. (Generator Set, serial numbers 929-001 thru 929-290).

Model	12257823
NSN	2420-01-054-0479
Type	Solid State
Rated Volts	28v nominal at 75 deg. F
Rated Power Out	4.2 kw at or below 75 deg. F 3.2 kw above 75 deg. F

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

2-1. General.

This section describes, locates and illustrates the various instruments, switches, and control levers provided for the operation of the generator set.

2-2. Engine Start Switch (fig. 2-1 and 2-1.1).

The engine start switch, located on the control panel, is a push button type switch used to start the engine when the generator set is connected to the battery power source.

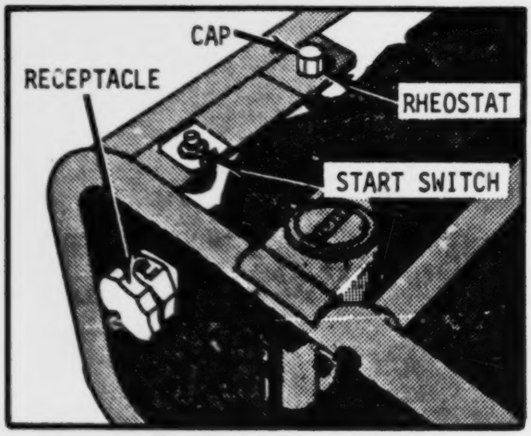


Figure 2-1. Control panel.
(Generator Sets serial numbers 923-001 thru 923-553)

8

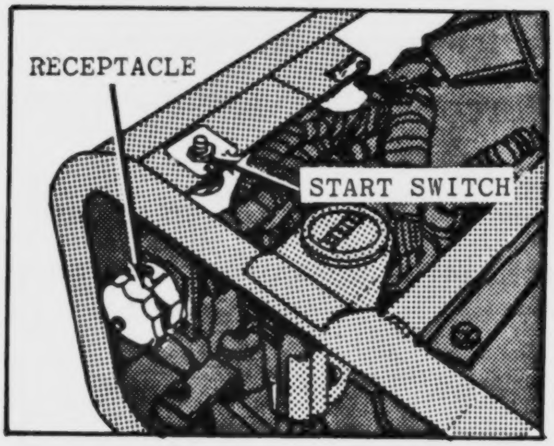

RECEPTACLE
START SWITCH

Figure 2-1.1 Control panel.
(Generator Set serial numbers
929-001 thru 929-290).

2-3. Engine Stop-Run Switch (fig. 2-2).

The engine stop-run switch, located on the right side of the engine, is a two position toggle switch used to stop the engine.

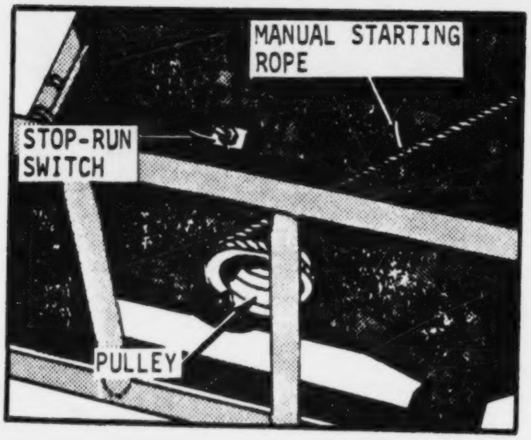

MANUAL STARTING ROPE
STOP-RUN SWITCH
PULLEY

Figure 2-2. Stop-run switch and starting rope.

2-4. Air Shutter Lever (fig. 2-3).

The air shutter lever, located on the engine air cleaner, is a three position lever used to regulate the heater air passed to the carburetor. The lever enables the engine to operate in cold weather by preventing "icing" in the fuel system. To place the lever in the deice position, move lever so that it is vertical to the air cleaner. For summer operation, place lever 45 degrees toward the front of the generator set, and for winter operation 45 degrees toward the rear.

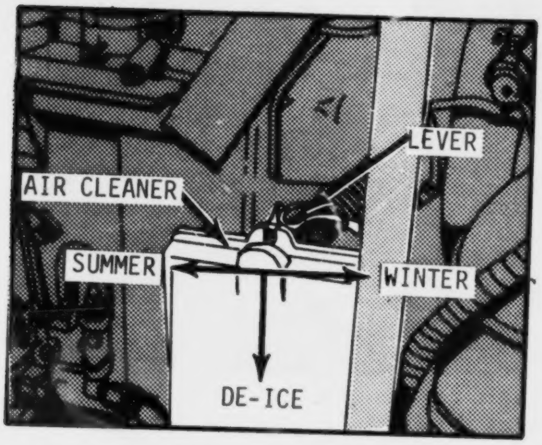


Figure 2-3. Engine air shutter lever.

2-5. Fuel Shutoff Valve (fig. 2-4).

The fuel shutoff valve, mounted to the fuel filter, is a three-way valve to shut off the fuel supply. The valve also allows fuel to flow from the fuel tank and enables the engine to operate on an outside fuel supply. The valve is closed when the shutoff clock is positioned as shown in figure 2-4 and open for fuel flow from the tank when the shutoff cock is turned toward the fuel filter.

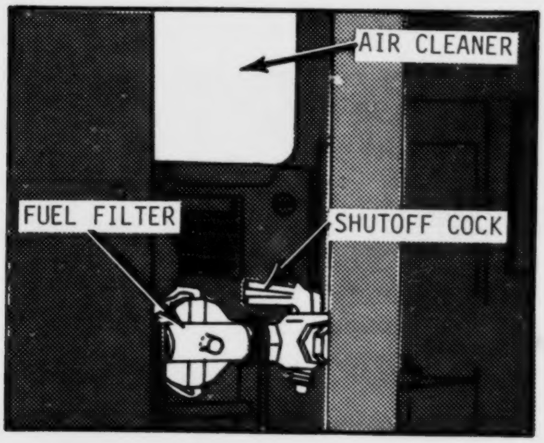


Figure 2-4. Fuel shutoff valve.

2-6. Engine Choke Control Lever (fig. 2-5).

The choke control lever, located on the carburetor, is used to control the amount of fuel-air mixture entering the engine. The lever is in the closed position when it extends toward the fuel tank.

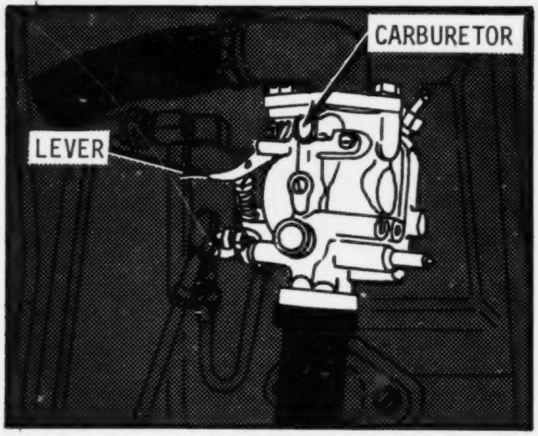


Figure 2-5. Engine choke control lever.

2-7. Starting Rope and Pulley (fig. 2-2).

The starting rope, kept with the generator set at all times, is used to crank the engine manually by wrapping rope clockwise around the starting pulley and pulling. The starting pulley is located at the front of the engine.

2-8. Voltage Adjusting Rheostat (fig. 2-1 or 2-1.1).

The rheostat, located on the control panel, regulates the generator output voltage. Voltage is increased by manually turning the knob under the cap in a clockwise direction. (Generator sets, serial numbers 929-001 thru 929-290) have no rheostat provided. The output voltage is fixed and non-adjustable.)

2-9. Fuel Tank Cap (fig. 2-6).

The fuel tank cap, located on top of the fuel tank, is turned counterclockwise to remove and clockwise to install.

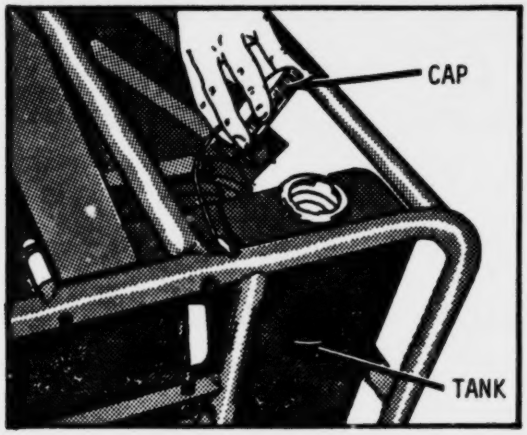


Figure 2-6. Fuel tank cap.

2-10. Electrical Receptacles (figs. 2-1 and 2-7).

The two electrical receptacles, one mounted to the control panel and the other to the outer frame at the front of the engine, connect the unit to the battery power source. The receptacle not connected to the battery may be used as an output for generator power. When not in use, the receptacles are covered with caps, installed by threading clockwise.

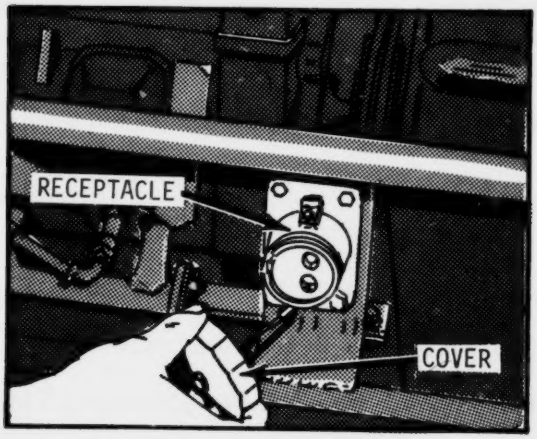


Figure 2-7. Electrical receptacle.

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

2-11. General.

a. Scope. This section contains instructions for preventive-maintenance of the generator set. Preventive-maintenance means systematic care, inspection, and servicing of equipment to maintain it in sound condition, and to find and correct beginning failures before expensive and time-consuming repairs or replacements are required.

b. Responsibility. Preventive-maintenance is done by operator personnel. Proper operation and use of equipment is just as important a part of preventive-maintenance as are the preventive-maintenance inspections and services prescribed in this section. For description of Army preventive-maintenance and its organization, refer to TM 38-750.

c. Frequency of Servicing. The chief guide for the frequency of preventive-maintenance services is the number of hours the generator set is operated, although operation under adverse conditions, such as extreme temperatures, dust, water, or mud, may require more frequent preventive-maintenance services. Daily preventive-maintenance services are required to insure that important parts of the equipment are checked regularly.

2-12. Daily Preventive-Maintenance Services.

a. General. Daily preventive-maintenance services are listed in table 2-1 and shall be followed by the operator each day the generator set is operated.

b. Intervals.

(1) Before operation (B). These checks and services are performed before starting the generator set. Be sure to review the Warnings before starting the engine.

(2) During operation (D). These checks and services are performed while the generator set is running. Be sure to keep the Warnings in mind while performing the checks and services.

(3) After operation (A). These checks and services are performed after shutting down the generator set. They make sure that the machine will be ready for operation the next time it is used.

If the generator set fails to operate properly, turn to the troubleshooting section. Use TM 38-750 to report any mechanical defects.

WARNING

Before each start up operation, inspect both drive keys, bushing, pulleys and belts for proper tightness and alignment. Check for a clearance of approximately 1/2 inch between each pulley assembly and the sidewall of fuel tank. A properly positioned drive key should not extend beyond end of its shaft.

TABLE 2-1. Daily Preventive Maintenance Services

B - Before D - During A - After

Item No.	Interval B	Interval D	Interval A	Item to be Inspected	Procedure Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available IF:
					Note. Position generator set as level as possible.	
1	•	•	•	Engine	Inspect engine to insure it is securely mounted to frame. Inspect for loose or missing hardware and any damage that might have occurred since engine was last serviced.	Missing hardware
2	•	•	•	Starter-generator	Inspect starter-generator to insure it is securely mounted to frame.	Missing hardware
3	•	•	•	Fuel system	Inspect for leaking fuel supply lines and connections and oil leaks on and around engine. Check fuel level.	Fuel leaking
4	•			Air cleaner	Service air cleaner.	
5	•		•	Drive belts	Inspect drive belts for breaks and frayed condition. Visually check belt tension for obvious looseness.	Cracks or breaks
6	•			Wiring harness cables and leads	Inspect wiring for broken, frayed, or damaged insulation.	Damaged insulation
7	•		•	Oil system	Inspect for oil leaks on and around engine	Oil leaking
8	•		•	Generator set	Inspect for dirt, mud, and excess grease, and clean as necessary.	-----
9		•		Generator set	Investigate any abnormal or unusual operation, such as too much vibration of the starter-generator or in the engine flywheel fan housing area, excessive exhaust smoke, or unusual engine noise.	Odd noises or other irregularities
10			•	Fuel filter	Clean fuel filter sediment bowl.	-----

Section III. OPERATION UNDER USUAL CONDITIONS

2-13. Service Upon Receipt of Material.

a. General. This section contains instructions for preliminary and break-in services on the generator set and operation under usual conditions. Whenever practicable, the generator set operator will assist in the performance of preliminary and break-in services on the generator set.

b. Preliminary Services.

(1) Removal of Generator Set from Shipping Container (fig. 2-8).

a. Generator set container shall be opened by cutting along "cutline" using either or the following methods:

1. Make initial cut with portable power saw with blade set at 1 inch depth. Cut through the remainder of the polyurethane foam with a hand saw or long blade knife.

2. Use a hand saw, preferably rip type, medium blade.

b. Using either method, the cut shall be continuous around the perimeter of the container. When using the hand saw, cut through the container shell using a sabre saw technique until the blade touches the protective sleeve.

CAUTION

Do not jam blade through sleeve
as generator set may receive
damage.

c. After cutting, remove top half of container, protective sleeves and protective wrapping.

d. Lift generator set from carton.

(2) General Procedures.

a. If any exterior surfaces are coated with rust preventive compound, remove it with dry cleaning solvent. Fed. Spec P-D-680.

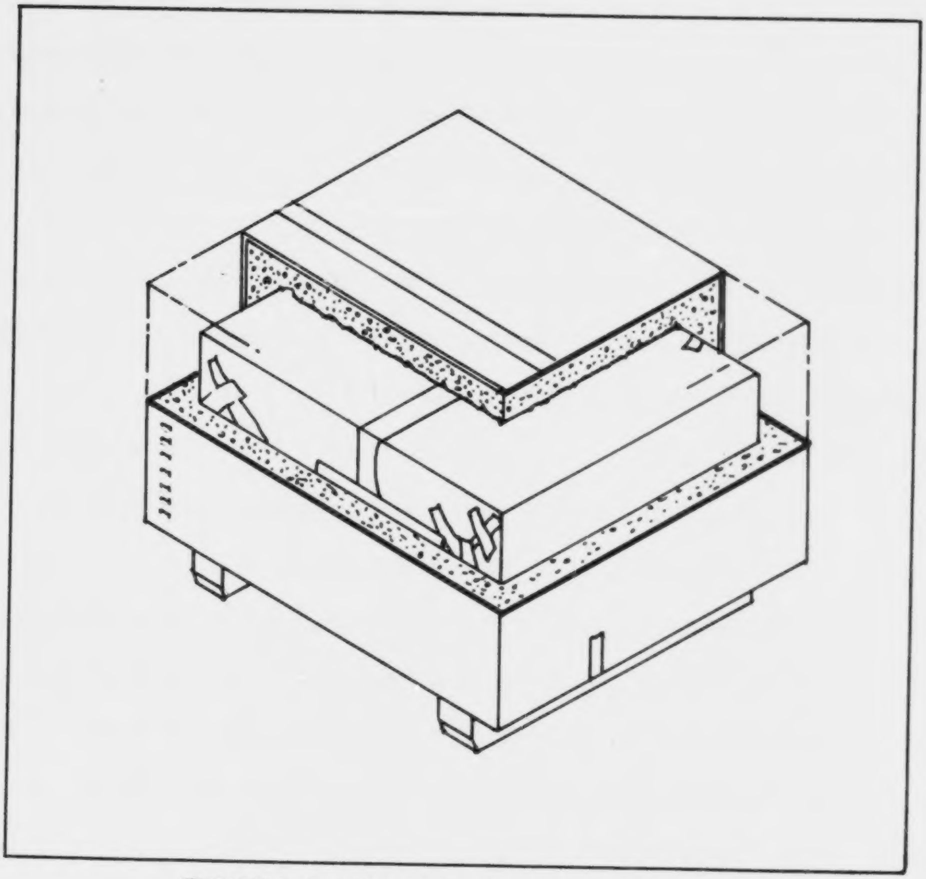


FIGURE 2-8, SHIPPING AND STORAGE CONTAINER.

Figure 2-8. Shipping and stowage container.

b. Crank engine by hand at least two revolutions before starting engine to test for hydrostatic lock. (This precaution is taken because there might be an excess of preservative oil in the combustion chamber).

c. Follow the preventive-maintenance procedures given in paragraphs 2-11 and 2-12.

c. Break-In Services.

(1) Remove spark plugs, clean with dry-cleaning solvent, and install.

(2) Check all lubricating points to see if generator and engine are adequately lubricated. Lubricate as required (par. 3-1 through 3-4).

(3) Check all electrical connections, particularly at engine magneto, at generator regulator, and in control panel for proper connection.

(4) Securely tighten any loose nuts or cap screws, and make certain there are no loose or leaking fuel lines.

d. Correction of Deficiencies.

(1) Deficiencies disclosed during preliminary inspection and servicing or during break-in period will be corrected by the using of organization or supporting maintenance.

(2) Serious deficiences which appear to involve unsatisfactory design or material will be reported on SF 368 (Quality Deficiency Report).

2-14. Operating Under Usual Conditions.

a. General. This material contains instructions for the mechanical steps necessary to operate the generator set under conditions of moderate temperatures and humidity. For operation under unusual conditions, refer to paragraphs 2-15 through 2-18. If any components are shipped detached, they must be assembled prior to any further action.

b. Before-Operation Services. Before starting the generator set, perform the daily preventive-maintenance services as prescribed in paragraph 2-12.

c. Starting Engine.

NOTE

Use gasoline fuel only.

(1) Connect generator set to 24-volt battery source (par. 2-10).

(2) Place choke control lever in closed position (par. 2-6).

(3) Throw air shutter lever to summer position (par. 2-3).

(4) Open fuel shutoff valve (par. 2-5).

(5) Push engine start switch for two or three revolutions of engine (par. 2-2).

NOTE

Engine may be turned over with starting rope (fig. 2-2).

(6) Place choke control lever in half-closed position (par. 2-6).

(7) Press engine start switch to start engine (par. 2-2).

(8) Move choke control lever to open position as engine warms up (par. 2-6).

d. Applying Generator Load. When possible, do not apply the load on the generator until the engine warms up and runs smoothly without benefit of the choke. Five minutes is normally sufficient for warmup. Adjust carburetor, if necessary, to obtain smooth operation. Adjust governor, if necessary, to maintain correct engine speed. Refer to TM 5-2805-203-14 for adjusting the carburetor and governor.

e. Operating Precautions.

WARNING

To avoid injury to personnel, read and follow the safety precautions inside front cover of this manual.

(1) Do not place hands in vicinity of generator drive belts, pulley, or engine flywheel while engine is operating.

(2) Use caution when filling fuel tank. Do not fill fuel tank while engine is running. Use clean, fresh gasoline that is free of oil, dirt, and water.

(3) Do not permit dirt to accumulate on engine. Dirt restricts the circulation of cooling air and causes overheating.

(4) Never operate generator set with engine governor disconnected or inoperative. Overspeeding will damage generator and engine.

(5) Do not use generator set to charge a dead battery.

f. Stopping Engine.

(1) Disconnect electrical output load from generator set receptacle (par. 2-10).

(2) Allow generator set to run with no load for 3 minutes.

(3) Stop engine by throwing stop-run switch (par. 2-3).

(4) Shut off fuel at fuel shutoff valve (par. 2-4).

Section IV. OPERATION AND MAINTENANCE UNDER UNUSUAL CONDITIONS

2-15. General.

a. Scope. This section contains instructions for operating and servicing the generator set in extreme cold or hot weather, dust, and after being subjected to water.

b. Special Maintenance. In addition to normal preventive-maintenance service, special care in cleaning and lubricating must be observed where extremes of temperature, humidity, and certain atmospheric conditions are present or anticipated. Proper cleaning, lubricating, storage, and handling of fuels and lubricants not only insure proper operation and functioning but also guard against excessive wear of the working parts and deterioration of the generator set. For lubrication under unusual conditions refer to paragraphs 3-3 and 3-4.

c. Report. When chronic failure of material results from subjection to extreme conditions, report the conditions on SF 368 (Quality Deficiency Report), in accordance with TM 38-750.

2-16. Extreme Cold Weather.

a. General.

(1) Operation problems. Extensive preparation of materiel for operation in extreme cold weather is necessary. Generally, extreme cold causes lubricants to thicken or congeal, freezes batteries or

prevents them from furnishing enough current for cold-weather starting, cracks insulation and causes electrical short circuits, prevents fuel from vaporizing and properly combining with air to form a combustible mixture for starting, and causes the various construction materials to become hard, brittle, and easily damaged or broken. For description of operation in extreme cold, refer to FM 9-207.

(2) Maintenance problems. The importance of maintenance must be impressed on all concerned. Maintenance of mechanical equipment in extreme cold is exceptionally difficult in the field. Even shop maintenance cannot be completed with normal speed, because the equipment must be allowed to thaw out and warm up before the mechanic can make satisfactory repairs, and maintenance frequently requires up to five times the normal amount of time. Bare hands stick to cold metal. Fuel in contact with the hands supercools by evaporation, and a hand can be painfully frozen in a matter of minutes. Engine oils, except subzero grades, are unpourable at temperatures below -40°F (-40°C). Sets in poor mechanical condition probably will not start at all, or only after hours of laborious maintenance and heating. Complete winterization, diligent maintenance, and well-trained crews are the key to efficient arctic-winter operations. For general information on extreme cold weather maintenance procedures, refer to FM 9-207.

(3) Winterization equipment. A special blowtorch is provided to start the generator set when operation is required in extreme cold weather (-25° to -65°F), (-31.7° to -54.4°C). Refer to C below for using the blowtorch.

b. Before-Operation.

(1) Provide some type of shelter to protect the generator set from wind and blowing snow. Erect a windbreak or place the generator

set in a sheltered area behind a building, a vehicle, or a natural barrier such as rocks or snow drifts. Operate the generator set in a location that also shelters the operator, thus permitting easier engine servicing and better engine performance.

(2) Prepare the generator set cover for operation (fig. 2-9).

(a) If generator set is to be started from battery source:

1. Turn buttons on two snap fasteners, and open battery receptacle flap.

2. Secure opened flap to cover with two snap fasteners.

(b) Turn buttons on three snap fasteners at rear of cover, and open control panel flap.

(c) Secure opened flap with snap fastener on top of cover.

(d) Unzip two slide fasteners on right flap at front and rear of cover.

(e) Fold right flap over top of cover.

(f) Unzip two slide fasteners on left flap.

(g) Turn buttons on five snap fasteners, and open left flap.

(h) Fold left flap over top of cover and secure with two snap fasteners on opened right flap.

(3) Do not use a blowtorch to thaw out iced generator set components. The water will only accumulate in another location and freeze again. If the generator set ices up, provide additional protection for the engine to raise the operating temperature: scrape or chip the ice away; dissolve the ice with alcohol; or, if possible, take the generator set into a heated enclosure and melt the ice. When ice is melted from the engine, the crankcase oil becomes diluted and must be changed before continuing engine operation.

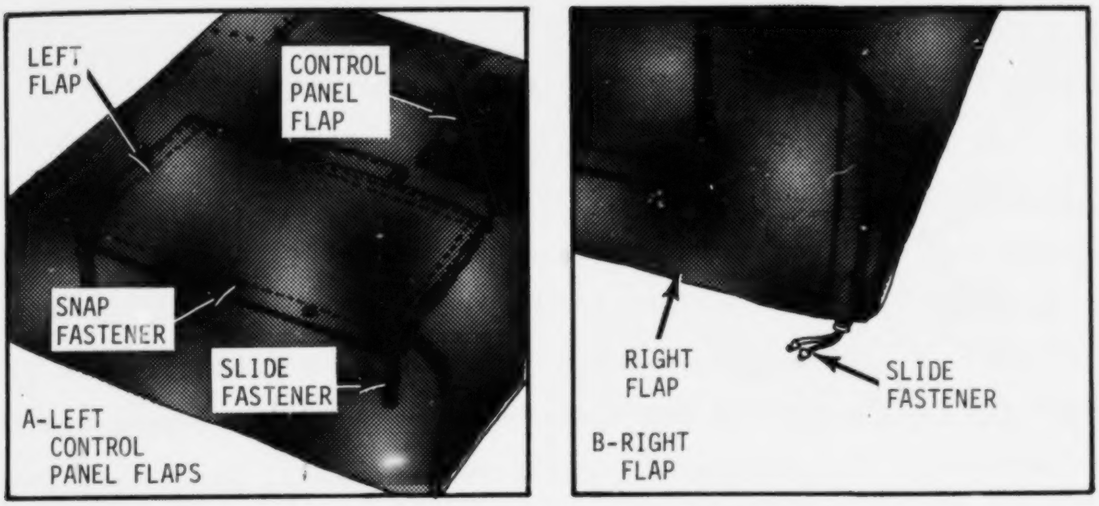

LEFT FLAP
CONTROL PANEL FLAP
SNAP FASTENER
SLIDE FASTENER
A-LEFT CONTROL PANEL FLAPS
RIGHT FLAP
SLIDE FASTENER
B-RIGHT FLAP

Figure 2-9. Cold weather cover.

c. Starting.

(1) Play the flame of blow-torch (fig. 2-10) back and forth over air intake preheater for 1 or 2 minutes.

CAUTION

Use caution to avoid damage from overheating. The blowtorch produces an extremely hot flame, and heat generated can melt parts and burn rubber insulation. Do not hold heat on metal part for more than 30 seconds. Do not direct heat at spark plug cables, fuel lines, fuel tank, carburetor, electric components, or resilient mounts. The correct heating procedure is to play the flame back and forth over the engine components to be warmed.

(2) Start engine (par. 2-14), but throw air shutter lever to winter instead of summer position.

(3) If engine fails to start after three tries, apply heat to exposed surface of air cleaner body, and repeat (1) and (2) above.

d. Operation. Avoid operating engine for short periods of time. A minimum of 30 minutes is required to evaporate the water vapor formed during the heating of cold metal parts. If the engine is operated less than 30 minutes, the water formed will mix with the lubricating oil and freeze or congeal the oil after shutdown.

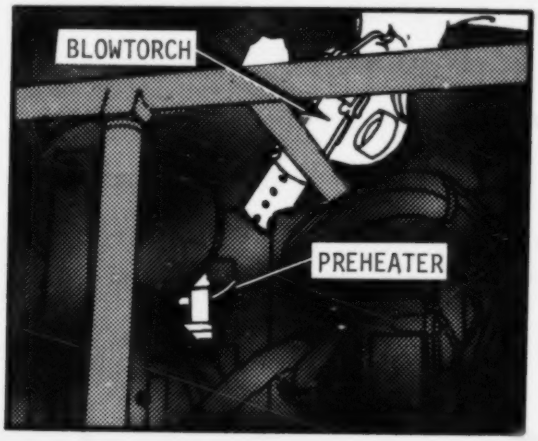


Figure 2-10. Using blowtorch to heat preheater.

2-17. Extreme Hot Weather or Dust.

a. General. High surrounding air temperatures alone are not detrimental to the generator set, but dust, or sand in the fuel and oil can lead to erratic engine operation, and shorten the life of mechanical parts very rapidly. Accumulation of dirt on the engine or generator can insulate the cooling system, reduce its efficiency, and cause excessively high engine operating temperatures. High atmospheric temperatures often deteriorate fuel by forming gum and varnish which can plug the fuel system components.

b. Operation and Maintenance.

(1) If possible, operate engine away from dust or dust-creating activities.

(2) Under extremely dusty conditions, service air cleaner frequently. Remove element daily, clean if required, and reinstall. Change crankcase oil and oil filter element as often as necessary to ensure clean oil.

(3) Use clean containers when adding fuel or lubricants to engine.

(4) Keep fuel filter screen in place.

(5) Check fuel filter and sediment bowl daily, and clean as required.

(6) Keep engine and generator cooling systems components clean and free of accumulated dirt, oil, and obstructions.

(7) Use only clean, fresh fuels and lubricants.

(8) Keep entire generator set free of accumulated dirt, oil, and dust.

2-18. Maintenance After Subjection to Water.

a. General. The generator set should be protected from water during rain or transport over water. If the generator set is exposed to water in excessive amounts or for extended periods of time, water may enter the engine crankcase and generator housing. The following precautions should be taken as soon as possible, and must be taken before starting the engine or operating the generator set.

b. Maintenance.

(1) Clean all surfaces exposed to water, and touch up with paint where necessary. Coat unpainted external metal parts with preservative lubricating oil (PE).

(2) Check lubricant in engine. If water has contaminated the lubricant, drain, flush, and refill as prescribed in paragraph 3-4.

(3) Remove band from generator, and dry interior with compressed air.

(4) Check fuel for water. If water has contaminated fuel, drain off water or drain fuel, and refill with clean fuel.

CHAPTER 3

MAINTENANCE INSTRUCTIONS

Section I. LUBRICATION INSTRUCTIONS

3-1. General.

a. Scope. This section contains information on lubrication of the generator set. Also refer to LO 5-2805-203-12 for lubrication information pertaining to the engine.

b. Responsibility. In general, daily lubrication services are performed by the operator of the generator set; quarterly lubrication services are performed by organization maintenance personnel assisted by the operator. Check engine oil level before each operation and when fuel is added.

3-2. Lubrication Under Usual Conditions.

a. Service Intervals. Service intervals shown on the engine lubrication order, LO 5-2805-203-12, are for normal operation and for moderate temperature, humidity, and atmospheric conditions.

b. Special Instruction. Special lubricating instructions required for specific items requiring one-time lubrication are covered in installation or repair instructions throughout this manual.

c. General Procedure.

(1) Clean fittings or filter openings before lubricating. Use cloth dampened with mineral spirits paint thinner (TPM) or drycleaning solvent (SD). Dry before lubricating.

(2) Observe lubricant level closely and replenish when necessary. Refer to paragraph 1-8 for refill capacities. The maintenance officer and sergeant will determine whether to lubricate at the quarterly service or separately, guided by the hourly accumulation and interval on the lubrication order.

d. Records and Reports.

(1) Report unsatisfactory performance of prescribed petroleum fuels, lubricants, or preserving materials, using DA Form 2407 (Maintenance Request) as instructed in DA PAM 738-750.

(2) Maintain a record of lubrication on DA Form 2408-1 (Equipment Daily or Monthly Log) in accordance with DA PAM 738-750.

e. Oil Can Points.

(1) As required, lubricate adjusting pivot points, governor control linkage pivot points and exposed threads on adjusting points

(2) Use general purpose lubricating oil (LO5-2805-203-12), and wipe off excess.

f. Draining Engine Oil. Unclip hose, and remove plug from end. See figure 3-1 for location of drain hose.

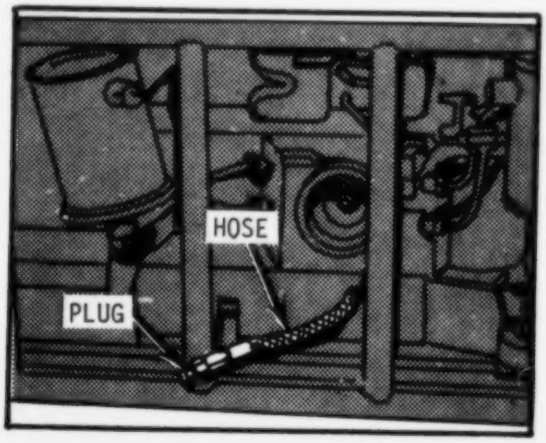


Figure 3-1. Engine oil drain.

3-3. Lubrication Under Unusual Conditions.

a. Service Intervals. Perform service intervals specified in LO 5-2805-203-12 when operating the equipment under unusual conditions. Lubricate oftener to compensate for abnormal or extreme conditions such as high or low temperature, continued operation in sand or dust, immersion in water, or exposure to moisture. Any one of these operations or conditions may cause contamination and quickly destroy the protective qualities of the lubricant. Lubrication can be less frequent during inactive periods if adequate preservation is maintained.

b. Expected Temperature Key. Lubricate as prescribed under "expected temperatures key" in LO 5-2805-203-12 for the three temperature ranges: above 32°F (0.0°C), from +40°F (4.4°C) to -10°F (-23.3°C), and from 0°F (-17.8°C) to -65°F (-54.4°C). Change the lubricant whenever weather forecasts indicate that the air temperature range will hold in the next higher or lower temperature range. No change in grade will be made for a temporary rise in temperature. Refer to TM 9-207 for necessary special preliminary lubrication on the generator set.

c. Continued Operation Below 0°F (-17.8°C). Refer to TM 9-207 for special lubrication on the generator set under continued extreme-cold operation.

CAUTION

Do not operate set with subzero lubrication oil (OES) when temperature is above 0°F (-17.8°C).

d. Proper Lubrication Levels. Observe lubricant levels closely and replenish when necessary to maintain proper levels. Refer to paragraph 1-8 for refill capacities. Do not overfill.

3-4. Lubrication After Subjection to Water.

a. Check lubricant in engine. If water has contaminated the lubricant, drain lubricant, remove filter, flush, install new filter element, and refill.

b. Check fuel in tank. If water has contaminated the fuel, drain off water or drain fuel, drain sediment bowl, clean filter, and refill with clean fuel.

c. Clean all surfaces exposed to water, and touch up with paint where necessary. Coat unpainted external metal parts with preservative lubricating oil (PE).

d. Inspect air cleaner element for moisture. If moisture is present, clean and dry element.

Section II. OPERATOR TROUBLESHOOTING

3-5. General.

This section contains information useful to the operator in diagnosing and correcting unsatisfactory operation or failure of the generator set.

a. Table 3-1 lists the common malfunctions which you may find during the operating or maintenance of the generator set. You should perform the tests/inspections in the order listed.

b. This manual cannot list all the malfunctions that may occur, nor all inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor. Any malfunction beyond the scope of operator maintenance shall be reported to higher level maintenance.

Table 3-1. Operator Troubleshooting

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

---

1. ENGINE WILL NOT CRANK
   - Step 1. Battery connections loose or dirty.
     Clean connectors and tighten.
   - Step 2. Battery discharged.
     Charge or replace battery.
   - Step 3. Notify organization maintenance.

2. ENGINE CRANKS BUT FAILS TO START
   - Step 1. Low or no fuel.
     Service fuel tank.
   - Step 2. Fuel shutoff valve in incorrect position.
     Fuel valve is open when shutoff cock is turned toward the fuel filter.
   - Step 3. Fuel filter clogged.
     Service fuel filter.
   - Step 4. Notify organization maintenance.

3. ALL OTHER MALFUNCTIONS
   - Step 1. Notify organization maintenance.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE AND SUPPORT EQUIPMENT

4-1. General.

This section contains information on the repair parts, tools, and equipment issued to the operator and organizational maintenance personnel for operating and maintaining the generator set. Tools and equipment should not be used for purposes other than prescribed and, when not in use, should be properly stored.

4-2. Repair Parts.

Repair parts are supplied to operator and organizational maintenance personnel for replacement of those parts that become worn, broken, or otherwise unserviceable, providing replacement of these parts is within scope of maintenance levels. Repair parts supplied for the generator set are listed in TM 5-6115-596-24P and for the engine in TM 5-2805-203-24P, which are the authority for requisitioning replacements.

4-3. Common Tools and Equipment.

Standard and commonly used tools and equipment having general application to the generator set are authorized for issue by tables of allowances and tables of organization and equipment.

4-4. Special Tools and Equipment.

Special tools required to perform organizational maintenance on the engine are listed in TM 5-2805-203-24P. No other special tools and equipment are required for the generator set.

Section II. SERVICE UPON RECEIPT

4-5. Service Upon Receipt of Material.

Refer to paragraph 2-13 for this information.

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

4-6. General Procedures for Quarterly Preventive-Maintenance Services.

a. General. Organizational mechanics must be thoroughly trained in the operator's duties, and apply them automatically at all times when performing organizational duties. The operator should present the generator set in reasonably clean condition for a scheduled preventive-maintenance service. The unit should be dry and not so caked with mud as to seriously hamper inspection and services. However, the generator set should not be washed immediately prior to inspection, since certain types of defects such as loose parts and oil leaks may not be evident immediately after washing.

b. Services. Organizational preventive-maintenance services are defined by, and restricted to, the following general procedures unless approval for change has been given by the supporting field maintenance unit.

(1) Adjusting. Make all necessary adjustments as instructed in this technical manual.

(2) Cleaning. Clean unit as required to remove old lubricant, dirt, and other foreign material.

(3) Special lubricating. Perform all special lubrication. This applies either to lubrication instructions that do not appear on the lubrication order, or to items that do appear but should be performed with the maintenance services.

(4) Special servicing. Perform special services, such as draining and refilling generator set with oil, and changing or cleaning the oil filter, air cleaner, and fuel filter elements.

(5) Tightening. Perform all tightening with enough wrench torque (force on the wrench handle) to tighten parts according to good mechanical practice. Use a torque-indicating wrench where specified. Do not overtighten; this may strip threads or cause distortion. Tightening will always include the correct installation of lock washers, lock nuts, locking wire, or cotter pins to secure the tightened nut or bolt.

(6) Checking modification work orders. At least every 6 months, check to see that all modification work orders have been applied. A list of current modification work orders is published in DA Pam 310-7. If a modification has not been applied, promptly notify the local field maintenance officer. No alteration or modification that affects the moving parts will be made by organizational personnel, except as authorized by official publications.

c. Frequency of Servicing. Quarterly services are performed every 3 months by organizational maintenance personnel assisted by the operator. Commanders are authorized to reduce the intervals between preventive-maintenance services whenever conditions indicate the need.

d. Special Conditions. When conditions make it difficult to perform the complete preventive-maintenance services at one time, they can sometimes be handled in sections. Plan to complete all services within the week, if possible. All available time at-halts and in-bivouac must be utilized, if necessary, to assure that maintenance services are completed.

4-7. Specific Procedures for Quarterly Semi-Annual Preventive-Maintenance Services.

Quarterly preventive-maintenance services are listed in table 4-1. DA Form 2404 (Equipment Inspection and Maintenance Worksheet) shall be used when performing these services, in accordance with instructions contained in TM 38-750.

Table 4-1. Organizational Preventive Maintenance Checks and Services

<table>
<tr><th>Sequence No.</th><th>Item to be Inspected</th><th>Procedure</th><th>Paragraph Reference</th></tr>
<tr><td>1</td><td>Lubrication</td><td>Lubricate engine, and report leaking oil seals or oil pan gasket to direct support personnel.</td><td>LO 5-2805-203 -12</td></tr>
<tr><td>2</td><td>Crankcase breathers</td><td>TM 5-2805-203-14</td><td></td></tr>
<tr><td>3</td><td>Air cleaner, cleaner hoses, & preheater.</td><td>TM 5-2805-203-14</td><td></td></tr>
<tr><td>4</td><td>High tension cables</td><td>TM 5-2805-203-14</td><td></td></tr>
<tr><td colspan="4">WARNING
Inspect drive belts for proper tightness and alignment after every 100 hours of continuous operation, or at least monthly during intermittent operation. If neither looseness nor misalignment is detected after six months (or 600 hours) of operation, further inspection may be performed on a six-month periodic basis. Any looseness of belts should be corrected on the organizational level, whereas any detection of looseness or misalignment of drive keys, bushings, or pulleys should be reported to Direct Support level for correction.</td></tr>
<tr><td>5</td><td>Drive belts</td><td>Replace broken & frayed drive belts. Check drive belt tension. Adjust drive belts showing improper tension.</td><td>Paragraph 4-27</td></tr>
<tr><td>6</td><td>Mufflers</td><td>Replace mufflers that show evidence of deterioration or holes. Tighten connections to manifolds if there are indications of leaks.</td><td>Paragraph 4-23</td></tr>
<tr><td>7</td><td>Fuel system</td><td>Tighten connections that show evidence of leaks. Replace fittings and hoses that are damaged, worn, or leaking.</td><td>Paragraph 4-20 through 4-22</td></tr>
<tr><td>8</td><td>Wiring harness cables & leads</td><td>Replace broken, frayed, or damaged electrical cables and leads.</td><td>Paragraph 4-36</td></tr>
</table>

Table 4-1. Organizational Preventive Maintenance Checks and Services (Con't)

Sequence No.	Item to be Inspected	Procedure	Paragraph Reference
9	Modification	See that all modification work orders applying to the generator set & the military standard engine have been completed and recorded on DA Form 2408-5 (Equipment Modification Record), DA Form 2408-8 (Equipment Acceptance & Registration Record), & DA Form 2408-7 (Equipment Transfer Report)	
10	Mounts	Tighten mounting hardware. Make certain all components are secure.	Paragraph 4-15

Section IV. TROUBLESHOOTING PROCEDURES

4-8. General.

a. Scope. This section contains troubleshooting information for locating and correcting some of the troubles that may develop in the generator set. Each malfunction or symptom of trouble given for an individual unit or system is followed by a list of probable causes or tests, and corrective action to remedy the malfunction. In many cases, the operator can only note the symptoms by detecting strange or unusual noises or conditions, and reporting these to organizational maintenance for further action.

b. Method. This technical manual cannot cover all possible troubles and deficiencies that may occur under the many conditions of operation. If a specific trouble, test, or remedy is not covered, isolate the system in which the trouble occurs, and then locate the defective components.

c. Maintenance Level. The tests and remedies in this section are governed by the scope of the organizational level of maintenance.

4-9. Troubleshooting.

a. For engine troubleshooting refer to TM 5-2805-203-14.

b. Table 4-2 lists possible malfunctions (symptoms), probable causes (tests), and corrective action (remedies) that can be performed by organizational maintenance personnel. Probable causes are listed in their order of probability, and should be checked in that order when troubleshooting the generator set.

4-10. Electrical Troubleshooting.

a. General. To successfully troubleshoot the electrical system, analyze the entire system as follows:

(1) Isolate the wiring harness in which the malfunction occurs.

(2) Isolate the circuit within the wiring harness that is not operating.

(3) Isolate the individual component within the circuit that is causing the malfunction.

b. Test Equipment. See Figure 4-1 for methods of electrical tests and equipment.

c. Circuits. See figures 4-2 and 4-2.1 for electrical schematic of generator set wiring and table 4-3 for electrical circuit numbers with a brief circuit-tracer description of each number.

d. Troubleshooting. Refer to table 4-4 and figures 4-3 and 4-3.1 troubleshooting the electrical system. Tests are given in order of probable component or circuit malfunction and should be checked in that order during troubleshooting.

e. Test Points. The following system of terminal, pin, and socket designations are used in table 4-4 as electrical test points.

(1) Generator. Generator terminals are designated by letters.

(2) Regulator.

(a) The regulator generator connector is termed CG.

(b) The regulator battery connector is termed CB.

(c) The connector pins or sockets are designated by letters.

Table 4-2. Organizational Troubleshooting

MALFUNCTION

PROBABLE CAUSE

CORRECTIVE ACTION

---

1. ALL ENGINE MALFUNCTIONS
   All probable causes Refer to TM 5-2805-203-14.

2. ENGINE CRANKS BUT FAILS TO START
   Step 1. Fuel shutoff valve is wrong position or defective valve.
   Open fuel shutoff valve (para 2-5) or replace.
   Step 2. Faulty fuel pump.
   Refer to TM 5-2805-203-14.
   Step 3. Air leak in fuel lines.
   Inspect hoses and fittings for leaks. Tighten fittings or replace defective components (para. 4-18).
   Step 4. Air leak in fuel filter.
   Replace sediment bowl gasket (TM 5-2805-203-14).

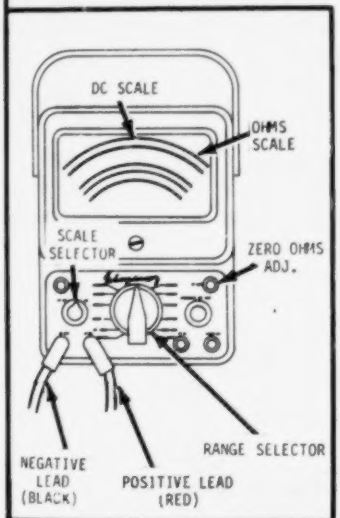
3. ENGINE NOISE EXCESSIVE
   Step 1. Defective mufflers.
   Inspect mufflers and replace if defective (para. 4-20).
   Step 2. Defective exhaust manifolds or manifold gaskets.
   Inspect exhaust manifolds and gaskets and replace if necessary (para 4-21).

4. FUEL CONSUMPTION EXCESSIVE
   Step 1. Leaking fuel lines or connections.
   Inspect hoses and fittings for leaks. Tighten fittings or replace defective components (para 4-18).
   Step 2. Punctured fuel tank.
   Inspect fuel tank and replace if fuel leaks are evident (para 5-12 through 5-15).

5. ENGINE FAILS TO DEVELOP FULL POWER
   Step 1. Restricted air cleaner.
   Refer to TM 5-2805-203-14.
   Step 2. Misadjusted governor or carburetor.
   Refer to TM 5-2805-203-14.

MULTIMETER

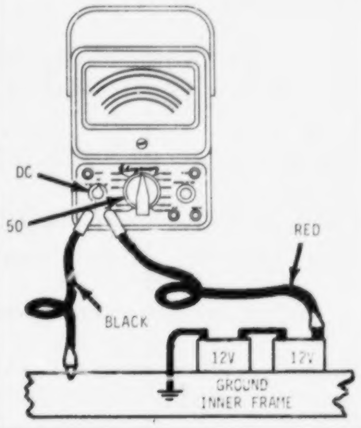
TEST EQUIPMENT: The authorized test equipment is Multimeter-6625-543-1438. It is a component of Tool Kits, Automotive Maintenance, Organizational (2nd Echelon) Set No. 1, Supplemental (SM9-4-5180-A17), and Set No. 2, Supplemental (SM9-4-4940-A08).


DC SCALE
OHMS SCALE
SCALE SELECTOR
ZERO OHMS ADJ.
RANGE SELECTOR
NEGATIVE LEAD (BLACK)
POSITIVE LEAD (RED)

USE OF MULTIMETER

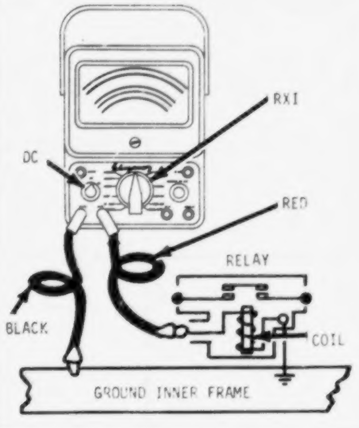
1. DC VOLTAGE TEST

1. Make certain what test you are making.
2. Select voltage range higher than expected reading.
3. Select DC scale on meter.
4. Connect negative (marked - or colored black) lead first.
5. Touch positive (marked + or colored red) lead and observe needle for correct movement prior to clipping.
6. DC voltage test is made to measure battery, generator or signal voltages.


DC
50
RED
BLACK
12V
12V
GROUND INNER FRAME

2. RESISTANCE

1. Make certain what test you are making.
2. Make certain all power is OFF."
3. Select DC scale on meter.
4. Select desired resistance range.
5. Touch leads together and adjust to "0" needle position.
6. Resistance test is made to measure resistance or ohmic values of coils and resistors as given in test procedures.


RXI
DC
RED
RELAY
BLACK
COIL
GROUND INNER FRAME

3. CONTINUITY TEST

1. Make certain what test you are making.
2. Make certain all power is "OFF."
3. Select DC scale on meter.
4. Select RXI scale.
5. Continuity test is used to check if wire or connector is in good condition. "0" reading indicates good cable, such as shown. High resistance reading or no needle movement may indicate an open circuit, damaged cable, or poor solder joint.

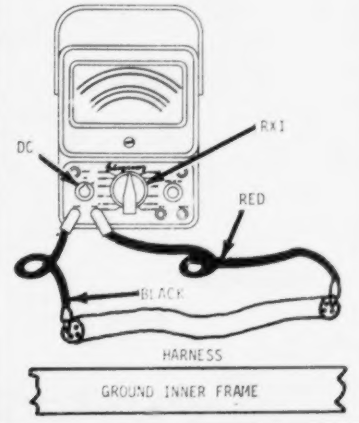

RXI
DC
RED
BLACK
HARNESS
GROUND INNER FRAME

Figure 4-1. Electrical test equipment.

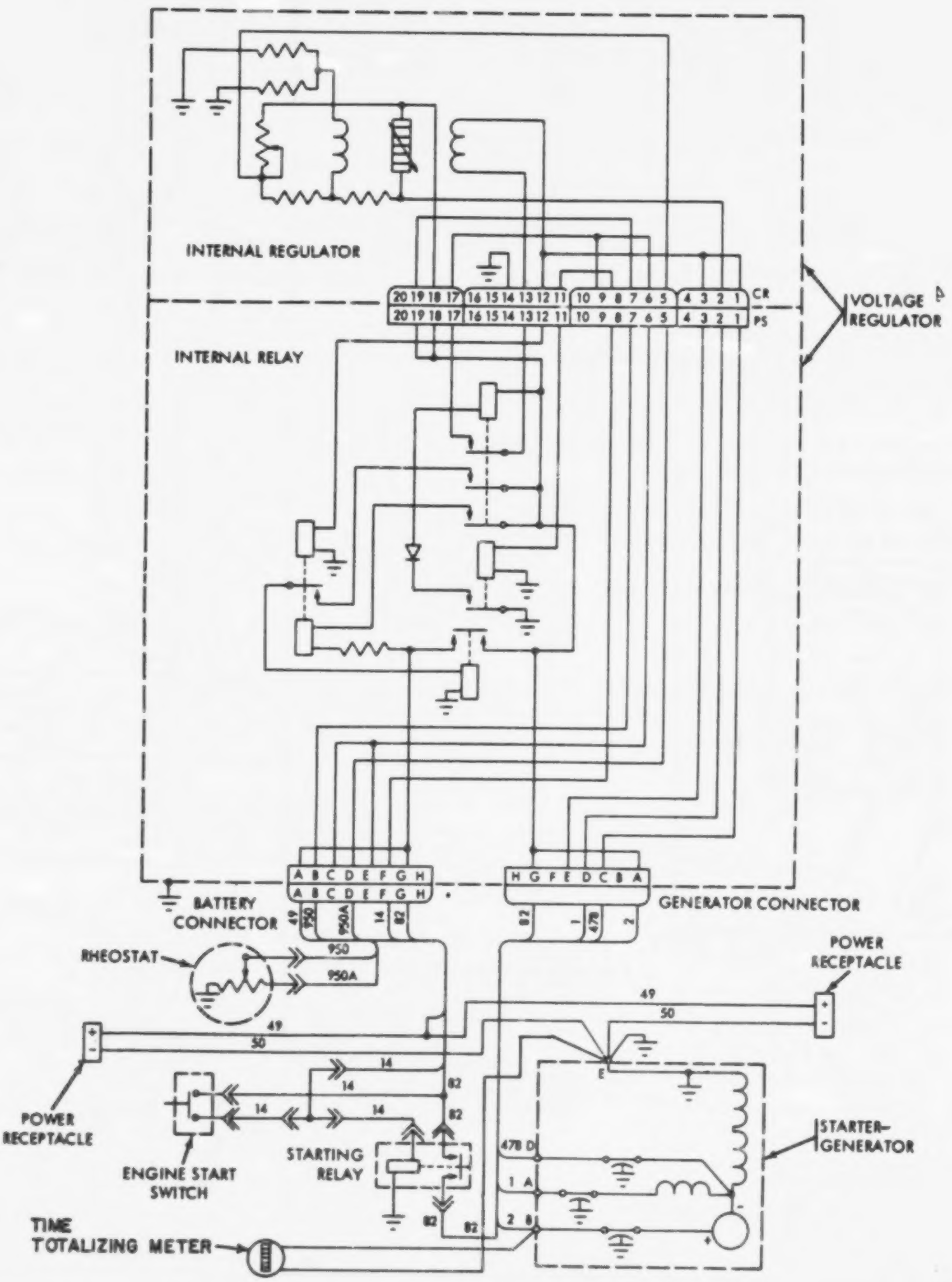

INTERNAL REGULATOR
20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
CR
PS
VOLTAGE REGULATOR
INTERNAL RELAY
A B C D E F G H
BATTERY CONNECTOR
49
950
950A
14
82
H G F E D C B A
GENERATOR CONNECTOR
82
1
478
2
RHEOSTAT
950
950A
POWER RECEPTACLE
49
50
+
-
49
50
POWER RECEPTACLE
14
14
14
14
82
82
82
82
ENGINE START SWITCH
STARTING RELAY
E
478 D
1 A
2 B
STARTER-GENERATOR
TIME TOTALIZING METER

Figure 4-2. Electrical schematic diagram.
(Generator Sets serial numbers 923-001 thru 923-553).

Table 4-3. Electrical Circuit Numbers (generator sets, serial numbers 923-001 thru 923-553)

Number	Description
1	Starter-generator pin "A" to regulator generator connector pin "D."
2	Starter-generator pin "B" to regulator generator connector pin "A."
14	Regulator battery connector pin "F" to Y connector through start switch to relay circuit 82 and from relay coil to Y connector.
49	Regulator battery connector pin "A" to power receptacles.
50	Starter-generator connector pin "E" to power receptacles.
82	Regulator battery connector pin "G" through relay contact points to regulator generator connector pin "G."
478	Starter-generator pin "D" to regulator generator connector pin "C."
950	Rheostat to regulator battery connector pin "B."
950A	Regulator battery connector pin "D" to rheostat.

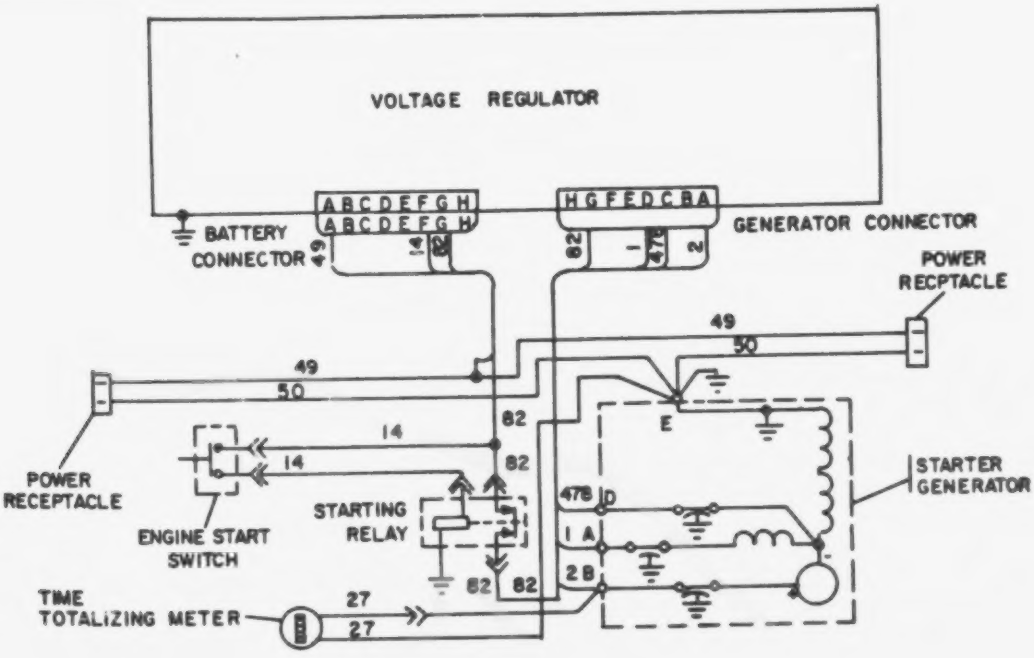

VOLTAGE REGULATOR
A B C D E F G H
A B C D E F G H
BATTERY CONNECTOR
49
14
82
H G F E D C B A
GENERATOR CONNECTOR
82
1
478
2
POWER RECPTACLE
49
50
49
50
82
14
14
82
E
POWER RECEPTACLE
ENGINE START SWITCH
STARTING RELAY
82
82
STARTER GENERATOR
478 D
1 A
2 B
TIME TOTALIZING METER
27
27

Figure 4-2.1 Electrical schematic diagram.

(Generator Sets serial numbers 929-001 thru 929-290)

Table 4-3.1 Electrical Circuit Numbers (generator sets, serial numbers 929-001 thru 929-290)

Number	Description
1	Starter-generator pin "A" to regulator connector pin "D."
2	Starter-generator pin "B" to regulator connector pin "A."
14	Regulator battery connector pin "F" to Y connector through start switch to relay circuit 82 and from relay coil to Y connector.
27	Time totalizing meter.
49	Regulator battery connector pin "A" to power receptacles.
50	Starter-generator connector pin "E" to power receptacles.
82	Regulator battery connector pin "G" through relay contact points to regulator generator connector pin "G."
478	Starter-generator pin "D" to regulator generator connector pin "C."

Table 4-4. Electrical Troubleshooting (Generator Sets serial numbers 923-001 thru 923-553)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

---

1. GENERATOR FAILS TO PRODUCE FULL OUTPUT VOLTAGE

Test 1. Disconnect circuit 950 lead and circuit 950A lead at Rheostat. Place prods across connectors.

If reading is lower or higher than 5 to 100 ohms, rheostat is defective. Refer to direct support maintenance personnel.

Test 2. Disconnect circuit 2 lead and circuit 478 lead at generator. Place prods across terminals B and D.

If reading shows an open circuit, replace starter-generator (para. 5-17).

Test 3. Disconnect circuit 478 lead and circuit 50 leads at generator. Place prods across terminals D and E.

If reading shows an open circuit, replace starter-generator (para. 5-17).

Test 4. Disconnect circuit 1 lead and circuit 50 leads at generator. Place prods across terminals A and E.

If reading is 0 ohms or infinity, replace starter-generator (para. 5-17).

Test 5. Disconnect circuit 1 lead and circuit 478 lead at generator. Place prods across terminals A and D.

If reading shows an open circuit, replace starter-generator (para. 5-17).

2. GENERATOR FAILS TO OPERATE

Test 1. Disconnect wiring harness connectors at voltage regulator. Place prods between CG-A, G, or H and voltage regulator case.

If reading is lower or higher than 45 to 50 ohms, voltage regulator is defective. Refer to direct support personnel.

Test 2. Check CG-C and E to case.

If reading is lower or higher than 2 ohms, regulator is defective. Refer to direct support maintenance personnel.

2. CONTINUED

Test 3. Check CG-A, G, or H to CG-D.
If reading is 1 ohm or higher, regulator is defective. Refer to direct support maintenance personnel.

Test 4. Check CB-A or G to case.
If reading is lower or higher than 150 to 175 ohms, regulator is defective. Refer to direct support maintenance personnel.

Test 5. Check CB-F to case.
If reading is lower or higher than 100 to 150 ohms, regulator is defective. Refer to direct support maintenance personnel.

Test 6. Check CB-C or E to CG-C or E.
If reading is lower than infinity, regulator is defective. Refer to direct support maintenance personnel.

Test 7. Check CB-B to CB-D.
If reading is lower or higher than 10 to 15 ohms, regulator is defective. Refer to direct support maintenance personnel.

Test 8. Disconnect wiring harness connectors at start switch. Place prods across connectors through switch.
If reading is higher than 0 ohms with switch depressed, switch is defective. If reading is lower than infinity with switch not depressed, switch is defective. Refer defective switch to direct support maintenance personnel.

Test 9. Disconnect relay-to-start switch lead at relay. Place prods across connector to ground.
If reading is lower or higher than 50-52 ohms, relay is defective. Refer to direct support maintenance personnel.

Test 10. Disconnect relay-to-regulator battery connector lead and relay-to-regulator generator connector lead at relay. Place prods across relay connectors.
If reading is lower than infinity, relay is defective. Refer to direct support maintenance personnel.

Test 11. Disconnect relay-to-start switch lead at relay. With battery current through relay, place prods across connector to ground.
If reading is higher than 0 ohms, switch is defective. Refer to direct support maintenance personnel.

Table 4-4.1 Electrical Troubleshooting (Generator Sets serial numbers 929-001 thru 929-290)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

---

1. GENERATOR FAILS TO PRODUCE REQUIRED OUTPUT VOLTAGE

Test 1. Disconnect circuit 2 lead and circuit 478 lead at generator. Place prods across terminals B and D.

If reading shows an open circuit, replace starter-generator (para. 5-17).

Test 2. Disconnect circuit 478 lead and circuit 50 leads at generator. Place prods across terminals D and E.

If reading shows an open circuit, replace starter-generator (para. 5-17).

Test 3. Disconnect circuit 1 lead and circuit 50 leads at generator. Place prods across terminals A and E.

If reading is 0 ohms or infinity, replace starter-generator (para. 5-17).

Test 4. Disconnect circuit 1 lead and circuit 478 lead at generator. Place prods across terminals A and D.

If reading shows an open circuit, replace starter-generator (para. 5-17).

2. GENERATOR FAILS TO OPERATE

Test 1. If output voltage is zero volts, press reset button on regulator assembly with generator set in operation. If operation is restored, then the fault was a transient over voltage condition that could result from a transient change in output loading.

Test 2. With generator set OFF check the drive belt tension. Excessive slippage will result in a low or zero generator output.

Test 3. Disconnect wiring harness connectors at start switch. Place prods across connectors through switch.

If reading shows an open circuit, with switch depressed, switch is defective. If reading is lower than infinity with switch not depressed, switch is defective. Refer defective switch to direct support maintenance personnel.

2. CONTINUED

Test 4. Disconnect relay-to-start switch lead at relay. Place prods across connector to ground.

If reading is lower or higher than 50-52 ohms, relay is defective. Refer to direct support maintenance personnel.

Test 5. Disconnect relay-to-regulator battery connector lead and relay-to-regulator generator connector lead at relay. Place prods across relay connectors.

If reading is lower than infinity, relay is defective. Refer to direct support maintenance personnel.

Test 6. Disconnect relay-to-start switch lead at relay. With battery current through relay, place prods across connector to ground.

If reading shows an open circuit, switch is defective. Refer to direct support maintenance personnel.

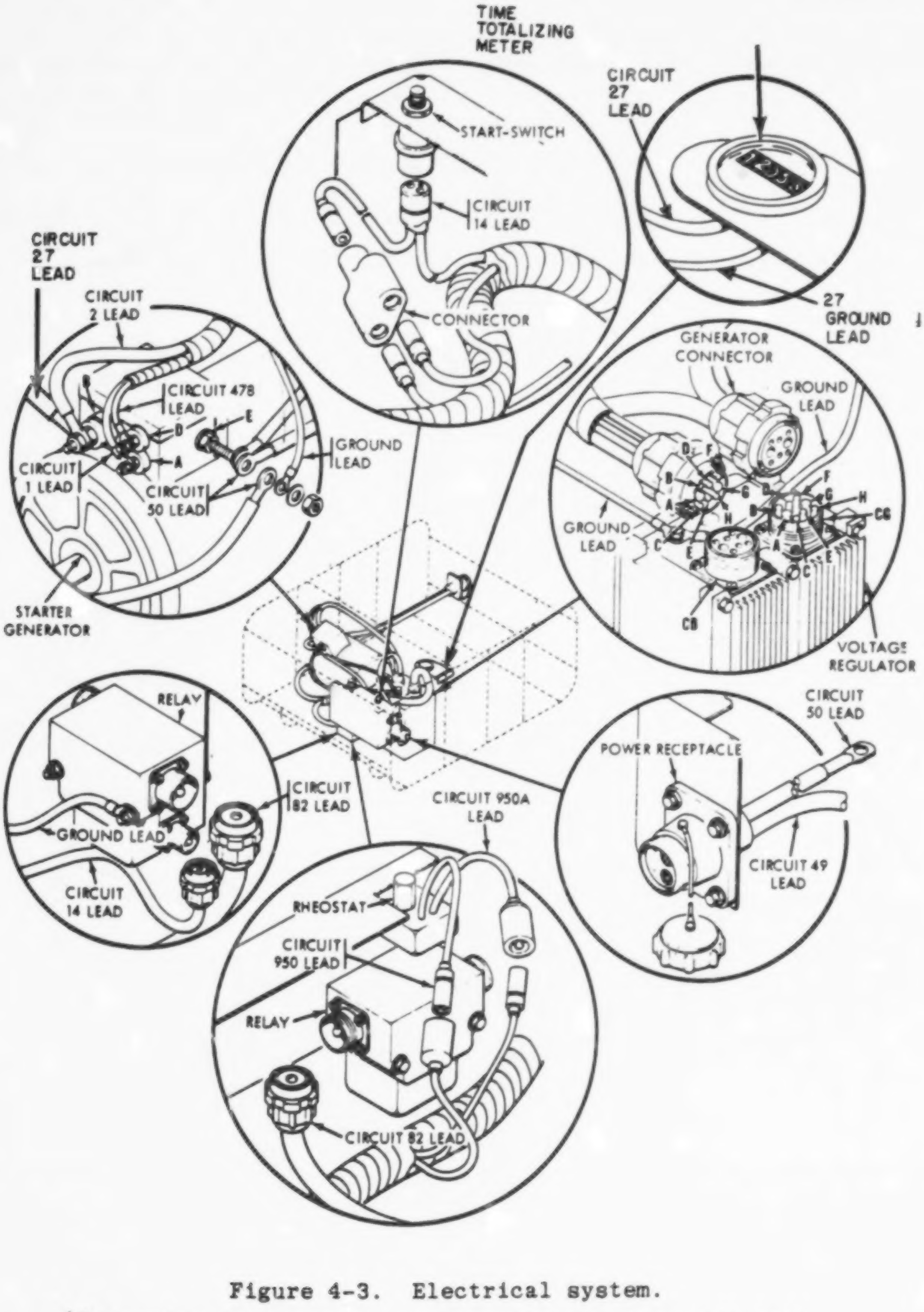

TIME TOTALIZING METER
CIRCUIT 27 LEAD
START-SWITCH
CIRCUIT 14 LEAD
CONNECTOR
27 GROUND LEAD
CIRCUIT 27 LEAD
CIRCUIT 2 LEAD
B
CIRCUIT 47B LEAD
D
E
GROUND LEAD
CIRCUIT 1 LEAD
A
CIRCUIT 50 LEAD
STARTER GENERATOR
GENERATOR CONNECTOR
GROUND LEAD
D
F
B
G
A
H
C
E
GROUND LEAD
CG
CB
VOLTAGE REGULATOR
RELAY
CIRCUIT 82 LEAD
GROUND LEAD
CIRCUIT 14 LEAD
CIRCUIT 950A LEAD
RHEOSTAT
CIRCUIT 950 LEAD
RELAY
CIRCUIT 82 LEAD
CIRCUIT 50 LEAD
POWER RECEPTACLE
CIRCUIT 49 LEAD

Figure 4-3. Electrical system.
(Generator Sets serial numbers 923-001 thru 923-553)

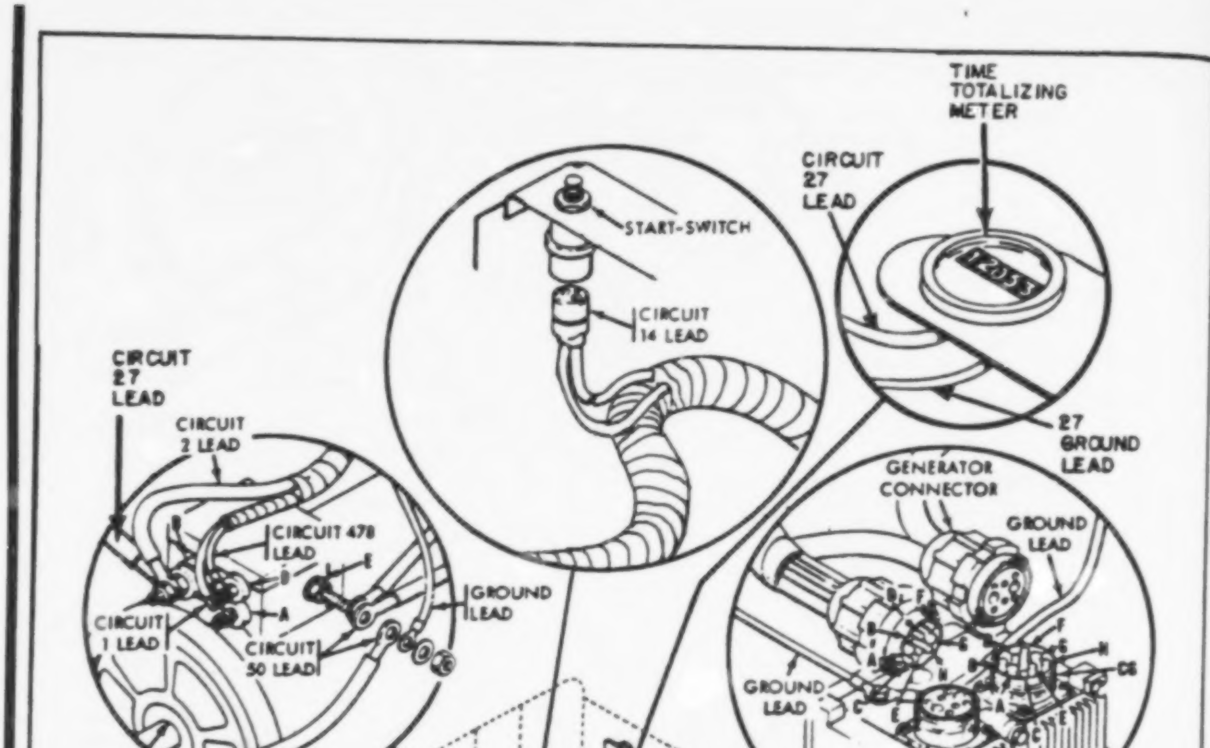

TIME
TOTALIZING
METER
CIRCUIT
27
LEAD
START-SWITCH
CIRCUIT
14 LEAD
27
GROUND
LEAD
CIRCUIT
27
LEAD
CIRCUIT
2 LEAD
CIRCUIT 478
LEAD
B
D
E
A
GROUND
LEAD
CIRCUIT
1 LEAD
CIRCUIT
50 LEAD
STARTER
GENERATOR
GENERATOR
CONNECTOR
GROUND
LEAD
F
G
H
C6
A
B
C
D
E
GROUND
LEAD
C8
VOLTAGE
REGULATOR
RELAY
CIRCUIT
82 LEAD
GROUND LEAD
CIRCUIT
14 LEAD
CIRCUIT
50 LEAD
POWER RECEPTACLE
CIRCUIT 49
LEAD

Figure 4-3.1 Electrical system.

(Generator Sets serial numbers 929-001 thru 929-290)

Section V. ENGINE MAINTENANCE PROCEDURES

4-11. General.

a. Scope. This section contains instructions for repair of the engine and inner frame resilient mounts.

b. Description and Maintenance. Refer to TM 5-2805-203-14.

4-12. Engine (fig. 5-1).

a. Coordination with Direct Support Maintenance Unit. Engine replacement must be coordinated with the direct support maintenance unit (par. 1-2).

b. Repair.

(1) Refer to TM 5-2805-203-14 for repair of engine and components.

(2) Check engine to make certain all components are securely mounted, including engine drive sheave (1).

(3) Refer to inspection section par. 5-8c. for inspection of engine after installation.

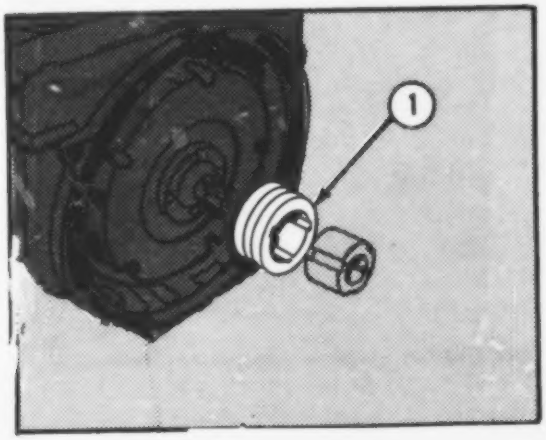


Figure 4-4. Drive Sheave.

4-13. Inner Frame Resilient Mounts (fig. 4-5).

NOTE

The four resilient mounts are removed and installed in a similar manner. Do not remove or install more than one mount at a time.

a. Removal.

(1) Remove screw (2) and two washers (3) securing inner frame (1) to resilient mount (4) and outer frame (8).

Legend for figure 4-5.

1 - Inner frame
2 - Inner frame screw
3 - Inner frame washer
4 - Inner frame resilient mount
5 - Resilient mount screw
6 - Resilient mount washer
7 - Resilient mount nut
8 - Outer frame

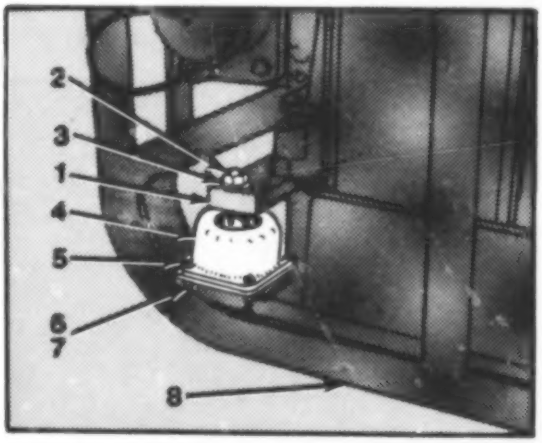


Figure 4-5. Inner frame resilient mounts.

(2) Remove four screws (5), nuts (7), and eight washers (6) securing mount to outer frame.

(3) Support inner frame, and remove mount.

b. Inspection and Repair. Inspect resilient mounts for cracks, wear, and loss of resiliency. Replace mounts that show any one of these defects.

c. Installation.

(1) Position resilient mount (4) between inner frame (1) and outer frame (8).

(2) Secure mount to outer frame with eight washers (6), four screws (5), and nuts (7).

(3) Secure inner frame to mount and outer frame with two washers (3) and screw (2).

Section VI. FUEL, AIR INTAKE, AND EXHAUST SYSTEM MAINTENANCE PROCEDURES

4-14. General.

a. Scope. This section contains instructions for draining and inspecting the fuel tank. Also, this section will cover the inspection and replacement of the fuel lines, fittings, hoses, muffler, and pipes. The inspection, service, repair, and replacement of the fuel filter will also be covered.

b. Maintenance. Refer to TM 5-2805-203-14 for maintenance instructions on the carburetor, fuel pump, air cleaner, and preheater.

c. Description. The generator set incorporates a positive-feed pressure fuel system. Fuel taken from the fuel tank is drawn through the fuel shutoff valve and filter by the fuel pump and forced under pressure into the carburetor. The carburetor mixes the fuel with air drawn through the air cleaner, air cleaner hose, and preheater. The preheater eliminates carburetor icing and preheats intake air during extreme cold-weather operation by utilizing heat radiated from the hot exhaust manifold. The combusted gases leave the cylinder cavities through the head, pass through the exhaust manifold and out through the mufflers, which dampen the sound.

4-15. Draining Fuel Tank (fig. 4-6).

a. Make certain all power is turned OFF.

b. Raise generator set from ground to a level position and place clean container of at least 8 gallons under fuel tank drain plug.

c. Remove plug, drain tank and remove sediment from tank.

d. After tank has been drained, install drain plug.

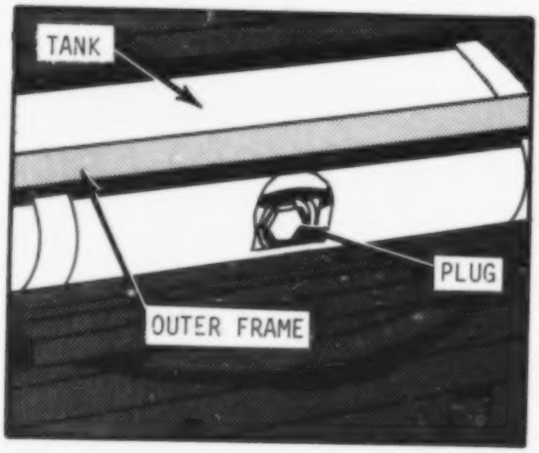


Figure 4-6. Fuel tank drain plug.

4-16. Inspection of Fuel Tank.

a. Inspection.

(1) Inspect threaded bosses for stripped or damaged threads.

(2) Inspect fuel tank fittings for distortion and damaged threads.

(3) Inspect tank for dents, cracks, and crushed places that would cause tank to leak.

(4) Inspect tank for discoloration, wet or damp markings, and other indications of fuel leakage.

(5) Inspect resilient pads under tank and replace them if damaged.

4-17. Fuel Filter (fig. 4-7).

a. Removal.

(1) Make certain all power is turned OFF.

(2) Drain fuel (par. 4-15) below level of fuel filter (13).

(3) Remove fuel shutoff valve (par. 4-19).

(4) Disconnect fuel filter to fuel pump hose (6) at filter outlet elbow (14), and remove elbow.

(5) Remove filter (13) from mounting bracket (12).

b. Inspection and Repair. Inspect filter for cracked or warped body, and fitting bores for damage threads. Replace filter that shows any one of these defects.

Legend for figure 4-7.

1 - Fuel tank outlet elbow

2 - Fuel tank

3 - Fuel tank-to-fuel shutoff valve hose

4 - Fuel pump inlet elbow

5 - fuel pump

6 - Fuel filter-to-fuel pump hose

7 - Shutoff valve hose connector

8 - Shutoff valve elbow

9 - Shutoff valve control cock

10 - Fuel shutoff valve

11 - Shutoff valve cap

12 - Filter mounting bracket

13 - Fuel filter

14 - Filter outlet elbow

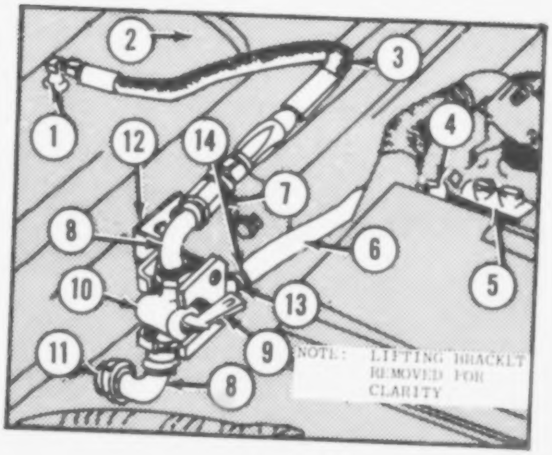

2
3
1
12
14
4
7
8
6
10
13
5
11
9
8
NOTE: LIFTING BRACKET REMOVED FOR CLARITY

Figure 4-7. Fuel filter, valve, and hoses.

c. Installation.

(1) Position fuel filter (13) to mounting bracket (12), and install filter outlet elbow (14).

(2) Install fuel shutoff valve (par. 4-19).

(3) Connect fuel filter-to-fuel pump hose (6) to filter elbow.

(4) Start engine, and check for fuel leakage.

4-18. Fuel Hoses (fig. 4-7).

a. Removal.

(1) Make certain all power is turned OFF.

(2) Drain fuel (par. 4-15) below level of hoses.

(3) Disconnect fuel tank-to-fuel shutoff valve hose (3) from valve hose connector (7).

(4) Disconnect hose (3) at tank outlet elbow (1), and remove hose.

(5) Disconnect fuel filter-to-fuel pump hose (6) at filter outlet elbow (14).

(6) Disconnect hose (6) from fuel pump elbow (4), and remove hose.

b. Inspection and Repair. Inspect hoses for deteriorated, twisted, broken, or worn condition. Inspect hose fittings for damaged threads and any condition that may cause hose to leak. Replace hoses that show any of these defects.

c. Installation.

(1) Connect fuel filter-to-fuel pump hose (6) to filter outlet elbow (14) and fuel pump elbow (4).

(2) Connect fuel tank-to-fuel shutoff valve hose (3) to tank outlet elbow (1) and valve hose connector (7).

(3) Start engine, and check for fuel leakage.

4-19. Fuel Shutoff Valve (fig. 4-7).

a. Removal.

(1) Make certain all power is turned OFF.

(2) Drain fuel (par. 4-15) below level of fuel shutoff valve (10).

(3) Disconnect fuel tank-to-shutoff valve hose (3) at valve hose connector (7).

(4) Turn valve counterclockwise and remove fuel filter (13).

(5) If replacement valve is to be installed, remove connector cap (11), and two elbows (8) from defective valve.

b. Inspection and Repair. Inspect valve for cracks and damaged threads. Replace valve that shows either of these defects.

c. Installation.

(1) If replacement fuel shutoff valve (10) is to be installed, reinstall connector (7), cap (11), and two elbows (8) on new valve.

(2) Thread valve into fuel filter (13) by turning clockwise.

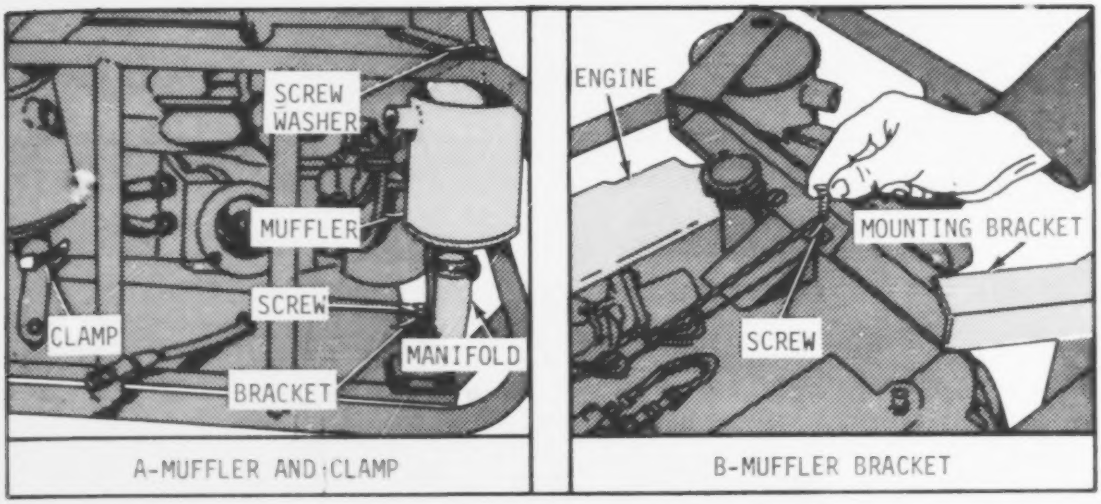
(3) Connect fuel tank-to-shutoff valve hose (3) to valve hose connector.

(4) Start engine, and check for fuel leakage.

4-20. Mufflers (fig. 4-8).

a. Removal.

(1) Remove two screws and six washers securing two mufflers to mounting bracket.


SCREW
WASHER
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SCREW
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MANIFOLD
BRACKET
A-MUFFLER AND CLAMP
ENGINE
MOUNTING BRACKET
SCREW
B-MUFFLER BRACKET

Figure 4-8. Removing or installing mufflers.

(2) Remove two screws, and remove bracket from engine.

(3) Loosen two clamps, and remove mufflers from exhaust manifolds.

b. Inspection and Repair. Inspect mufflers for holes, cracks, and deformation. Replace mufflers that show any one of these defects.

c. Installation.

(1) Position two mufflers to exhaust manifolds and secure with two clamps.

(2) Position muffler mounting bracket to top of engine and mufflers, and secure with two screws.

(3) Secure mufflers to bracket with six washers and two screws.

4-21. Flanged Manifold (fig. 4-9).

NOTE

The front and rear flanged manifolds are removed and installed in a similar manner.

a. Removal.

(1) Remove mufflers (par. 4-20).

(2) Loosen screw, and move manifold bracket away from manifold (fig. 4-8).

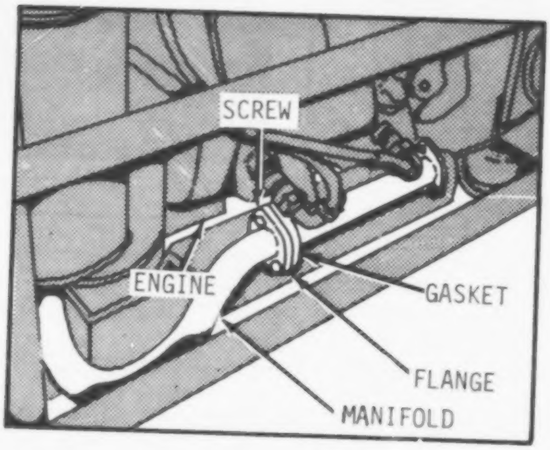


Figure 4-9. Flanged manifolds.

(3) Remove two screws, and remove manifold with two flanges and gasket from engine.

b. Inspection and Repair.

(1) Inspect manifolds and flanges for dents, cracks, and deformation. Replace manifolds or flanges that show any one of these defects.

(2) Inspect gaskets for tears and deterioration and replace if necessary.

c. Installation.

(1) Position manifold with two flanges and gasket to engine and secure with two screws.

(2) Position manifold bracket to manifold, and tighten screw (fig. 4-9).

(3) Install mufflers (par. 4-20).

Section VII. ELECTRICAL SYSTEM MAINTENANCE PROCEDURES

4-22. General.

a. Scope. This section contains instructions for organizational maintenance of the generator drive belts, generator control panel repair and controls, and electrical harness and cables.

b. Description. The generator is operated as a starter to start the gasoline engine, which is governed at 3,600 rpm to drive the generator at 4,500 rmp. The generator regulator controls the voltage output and current flow through the interconnecting electrical harnesses and cables.

4-23. Starter-Generator Drive Belts (fig. 4-10).

a. Adjustment.

(1) Loosen three screws securing drive belt brace to generator and engine.

(2) Loosen two screws securing generator and inner frame.

(3) Push generator away from engine until ¼-inch deflection is obtained when 3 to 4½ pounds force is applied to midpoint of belt span.

(4) Tighten three screws securing drive belt brace to generator and engine.

(5) Tighten two screws securing generator to inner frame.

(6) Tighten three screws securing drive belt brace to generator brace and engine.

b. Removal.

(1) Loosen three screws securing drive belt brace to generator and engine.

(2) Loosen two screws securing generator to inner frame.

(3) Remove drive belts from two drive belt sheaves.

c. Inspection and Repair. Twist belts until underside shows. Inspect for cracks, frayed sides, and separated laminations. Replace belts with matched pair if any one of these defects shows.

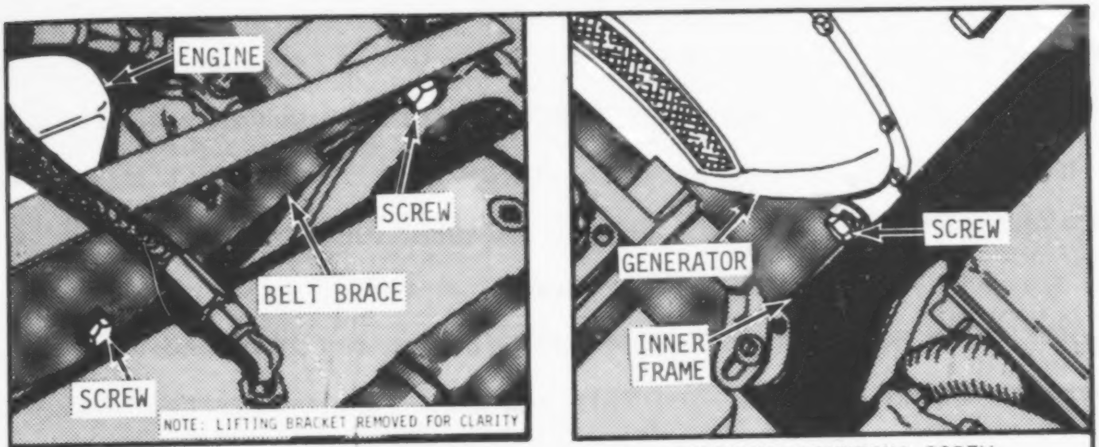
d. Installation.

(1) Install drive belts on two drive belt sheaves.

(2) Adjust drive belts (a above).

(3) Tighten two screws securing generator to inner frame.

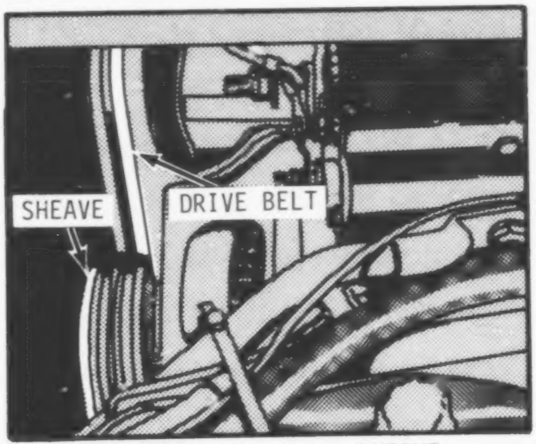
(4) Tighten three screws securing drive belt to generator and engine.


ENGINE
SCREW
BELT BRACE
SCREW
GENERATOR
SCREW
INNER FRAME

NOTE: LIFTING BRACKET REMOVED FOR CLARITY

A- DRIVE BELT BRACE SECURING SCREWS

B- GENERATOR MOUNTING SCREW


SHEAVE
DRIVE BELT

C- DRIVE BELTS AND SHEAVE

Figure 4-10. Starter-generator drive belts.

4-24. Control Panel Repair.

4-25. General.

a. Scope. This section contains instructions for removal, disassembly, inspection and repair, assembly, and installation of the control panel.

b. Description. The control panel assembly is an open-type panel which mounts the voltage control rheostat (generator sets, serial numbers 923-001 thru 923-553), engine start switch, and relay and housing assembly.

4-26. Removal (fig. 4-11 or 4-11.1).

NOTE

It is not necessary to remove the control panel to remove any one of the controls. Refer to paragraphs 4-27 for removal of control parts.

a. Disconnect relay-to-start lead (14) and relay-to-regulator battery connector lead at relay (2).

b. Remove four screws (15), nuts (16), and eight washers (17), and remove power receptacle (4) from control panel (5).

c. For generator sets with serial numbers 923-001 thru 923-553 disconnect circuit 950 lead (8) and circuit 950A lead (20) at rheostat connectors (7).

d. Disconnect leads (18) at engine start switch (6).

e. Remove screw (3), nut (12), and two washers (13), and disconnect regulator ground lead (21) at relay.

f. Disconnect relay-to-regulator generator connector lead (19) at relay.

g. Remove three screws (9) and washers (10), and remove panel from outer frame (11).

4-27. Disassembly (fig. 4-12 or 4-12.1).

a. Remove screw (4), nut (14), lockwasher (13), and flat washer (12), and remove relay and housing assembly (11) from panel (8).

b. For generator sets with serial numbers 923-001 thru 923-553, remove two screws (5), lockwashers (6), and flat washers (7), and remove voltage control rheostat (10) and two spacers (9) from panel.

c. Remove hex nut (1) and remove engine start switch (15) from panel.

4-28. Control Panel Controls. After removal and disassembly of one or more of the controls on the control panel, inspect and repair the item as described in the following paragraph.

4-29. Inspection and Repair.

a. Relay and Housing Assembly.

(1) Inspect relay for electrical continuity as described in electrical troubleshooting (para. 4-10). Replace relay if defective.

(2) Inspect relay for evidence of overheating, deep dents, and other damage. Replace relay that shows any one of these defects.

b. Rheostat. (Generator Sets with serial numbers 923-001 thru 923-553).

(1) Inspect rheostat for electrical continuity as described in electrical troubleshooting (para. 4-10). Replace rheostat if defective.

(2) Rotate adjusting knob to determine if knob moves freely. If knob is frozen, replace rheostat.

(3) Inspect rheostat for any external damage that would cause it not to function properly. Replace rheostat that shows damage.

c. Engine Start Switch.

(1) Inspect switch for electrical continuity as described in electrical troubleshooting (para. 4-10). Replace switch if defective.

(2) Inspect switch for any external damage that would cause it not to function properly. Replace switch that shows damage.

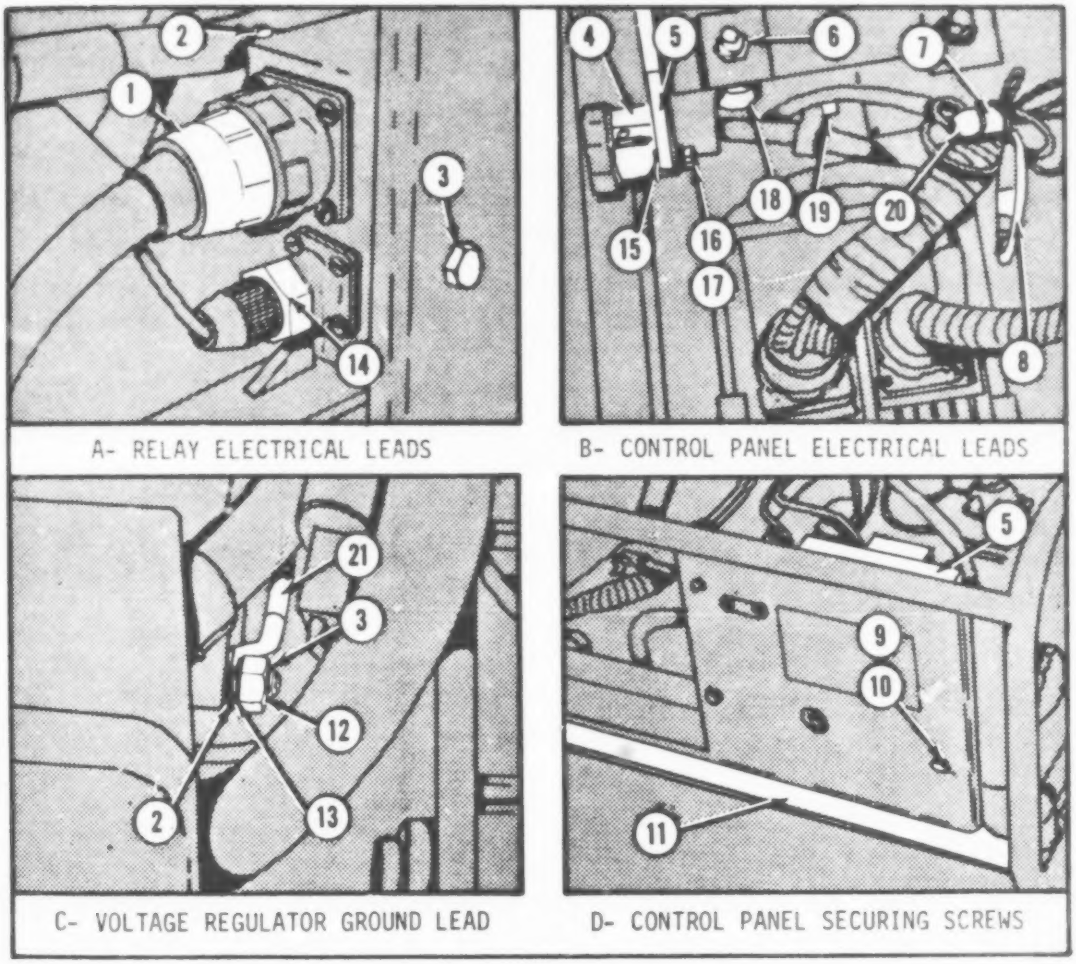
4-30. Assembly (fig. 4-12).

a. Position engine start switch (15) to control panel (8) and secure with hex nut (1).

b. For generator sets with serial numbers 923-001 thru 923-553, position voltage control rheostat (10) and two spacers (9) to panel and secure with two flat washers (7), lockwashers (6), and screws (5).

Legend for figure 4-11.

1 - Relay-to-regulator battery connector lead
2 - Relay and housing assembly
3 - Regulator ground lead screw
4 - Power receptacle
5 - Control panel
6 - Engine start switch
7 - Rheostat connector
8 - Circuit 950 lead
9 - Control panel screw
10 - Control panel washer
11 - Outer frame
12 - Regulator ground lead nut
13 - Regulator ground lead washer
14 - Relay-to-start switch lead
15 - Power receptacle screw
16 - Power receptacle nut
17 - Power receptacle washer
18 - Engine start switch lead
19 - Relay-to-regulator generator connector lead
20 - Circuit 950A lead
21 - Regulator ground lead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A- RELAY ELECTRICAL LEADS

B- CONTROL PANEL ELECTRICAL LEADS

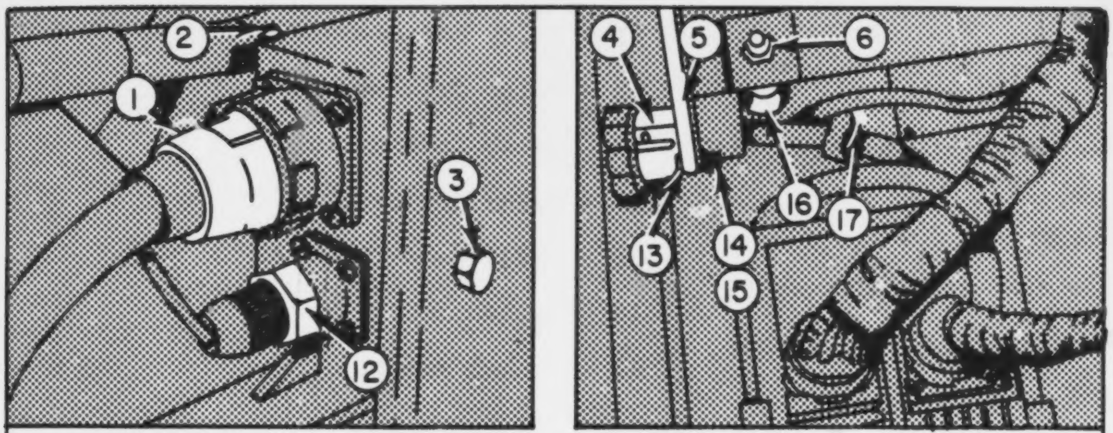
C- VOLTAGE REGULATOR GROUND LEAD

D- CONTROL PANEL SECURING SCREWS

Figure 4-11. Control panel removal points.
(Generator Sets serial numbers 923-001 thru 923-553)

Legend for figure 4-11.1

1 - Relay-to-regulator battery connector lead
2 - Relay and housing assembly
3 - Regulator ground lead screw
4 - Power Receptacle
5 - Control panel
6 - Engine start switch
7 - Control panel screw
8 - Control panel washer
9 - Outer frame
10 - Regulator ground lead nut
11 - Regulator ground lead washer
12 - Relay-to-start switch lead
13 - Power receptacle screw
14 - Power receptacle nut
15 - Power receptacle washer
16 - Engine start switch lead
17 - Relay-to-regulator generator connector lead
18 - Regulator ground lead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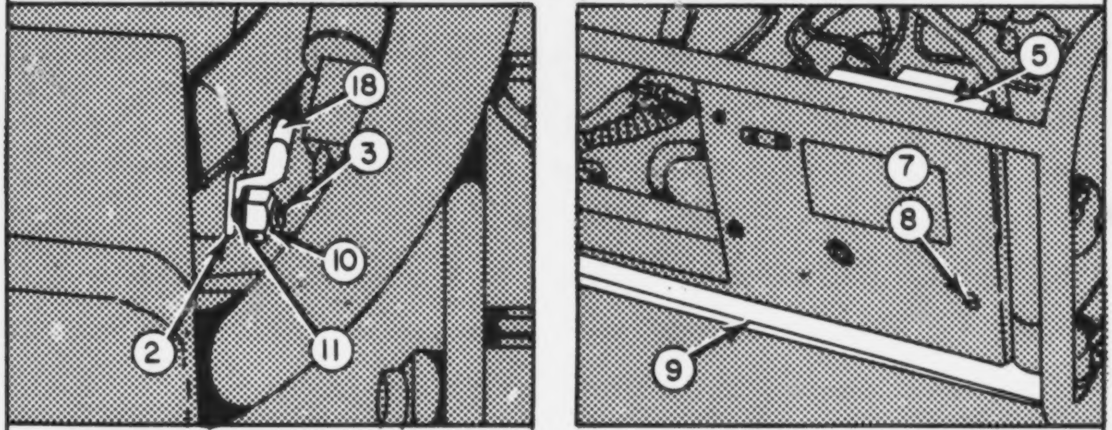
A-RELAY ELECTRICAL LEADS B -CONTROL PANEL ELECTRICAL LEADS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C-VOLTAGE REGULATOR GROUND LEAD. D-CONTROL PANEL SECURING SCREWS

Figure 4-11.1 Control panel removal points.

(Generator Sets serial numbers 929-001 thru 929-290)

best copy available

Legend for figure 4-12.

1 - Engine start switch hex nut

2 - Plate rivet

3 - Switch identification plate

4 - Relay and ground lead screw

5 - Rheostat screw

6 - Rheostat lockwasher

7 - Rheostat flat washer

8 - Panel

9 - Rheostat spacer

10 - Voltage control rheostat

11 - Relay and housing assembly

12 - Relay flat washer

13 - Relay lockwasher

14 - Relay and ground lead nut

15 - Engine start switch

16 - Switch nut

17 - Switch washer

c. Position relay and housing assembly (11) to panel and secure with flat washer (12), lockwasher (13), screw (4), and nut (14).

4-31. Installation (fig. 4-11 or 4-11.1).

a. Position control panel (5) to outer frame (11) and secure with three washers (10) and screws (9).

b. Connect regulator ground lead (21) to relay and housing assembly (2) and secure with screw (3) two washers (13), and nut (12).

c. Connect leads (18) to engine start switch (6).

d. Connect circuit 950 lead (8) and circuit 950A lead (20) to rheostat connectors (7). (Generator Set, serial numbers 923-001 thru 923-553).

e. Position power receptacle (4) to control panel and secure with eight washers (17), four screws (15), and nuts (16).

f. Connect relay-to-regulator generator connector lead (19) to relay.

g. Connect relay-to-start switch lead (14) and relay-to-regulator battery connector lead (1) to relay.

4-32. Wiring Harnesses and Cables.

a. General. Repair of wiring harnesses and cables is limited to replacing connectors, terminals, and receptacles. General procedures for repairing cables are the same. Make certain all power is turned OFF before starting repairs. Most cables are repaired without removal from generator set, by disconnecting the connector or terminal to be replaced from its components.

b. Inspection. Examine wiring harnesses and cables for frayed, broken, or cracked insulation. Replace defective wires or cables. Check for damaged connectors or terminals. Replace connectors or terminals that show damage.

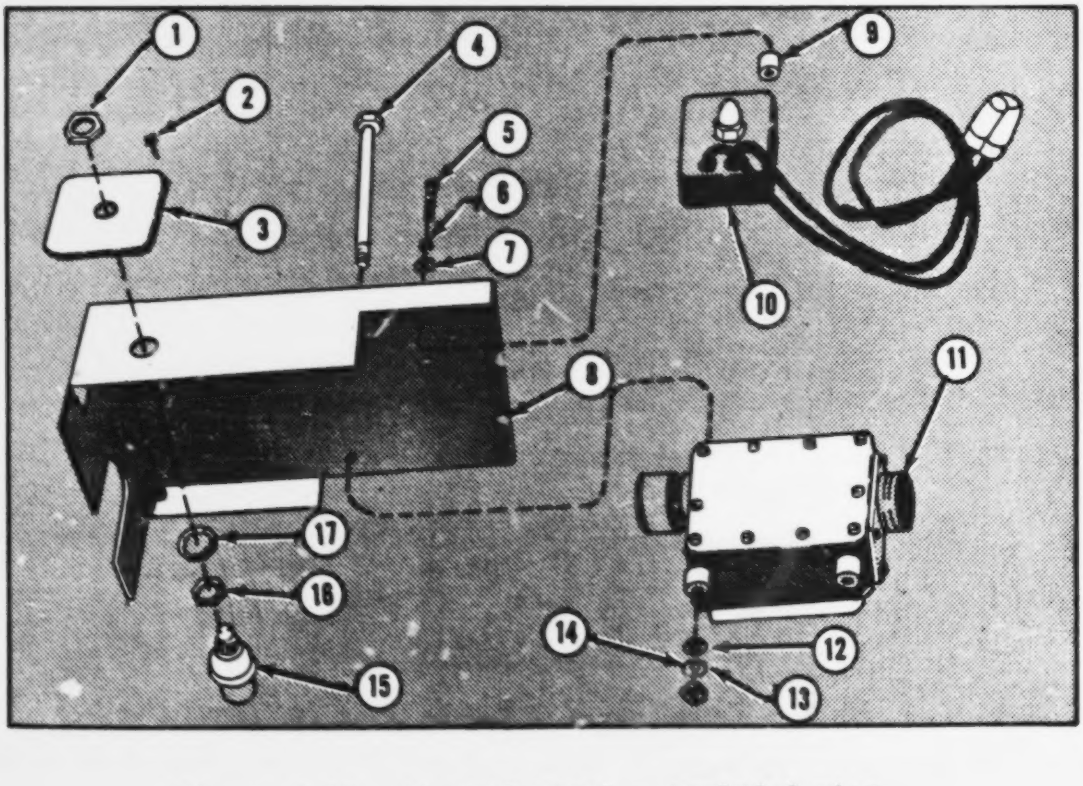

Figure 4-12. Control panel — exploded view.
(Generator Sets serial numbers 923-001 thru 923-553)

c. Repair. See figures 4-13 and 4-14 for repairing wiring harnesses and cables.

4-33. Removal and Installation of Wiring Harness.

4-34. General.

a. Scope. This section contains instructions for removal, inspection and repair, and installation of the generator-to-regulator and power receptacle wiring harnesses.

b. Description. The generator-to-regulator wiring harness interconnects the starter-generator, voltage regulator assembly, and relay assembly, and furnishes current to the generator for starting the engine. The power receptacle wiring harness interconnects the output voltage to a load(s) through two receptacles and controls the generator output voltage.

4-35. Generator-to-Regulator Wiring Harness (fig. 4-15).

a. Removal.

(1) Make certain all power is turned OFF.

NOTE

When removing wiring harness, it may be necessary to remove tie-strap. Make certain straps are replaced when wiring harness is installed.

(2) Disconnect regulator generator connector (11) at generator regulator (3).

(3) Disconnect relay-to-regulator generator connector lead (1) at relay (2).

(4) Remove three nuts (9) and washers (8), and disconnect circuit 1 lead (7), circuit 2 lead (4), and circuit 478 lead (5) at starter-generator (6).

(5) Remove wiring harness (10) from generator set.

Legend for figure 4-12.1

1 - Engine start switch
2 - Plate rivet
3 - Switch identification plate
4 - Relay and ground lead screw
5 - Regulator decal
6 - Panel
7 - Relay and housing assembly
8 - Relay flat washer
9 - Relay lockwasher
10 - Relay and ground lead nut
11 - Engine start switch
12 - Switch nut
13 - Switch washer

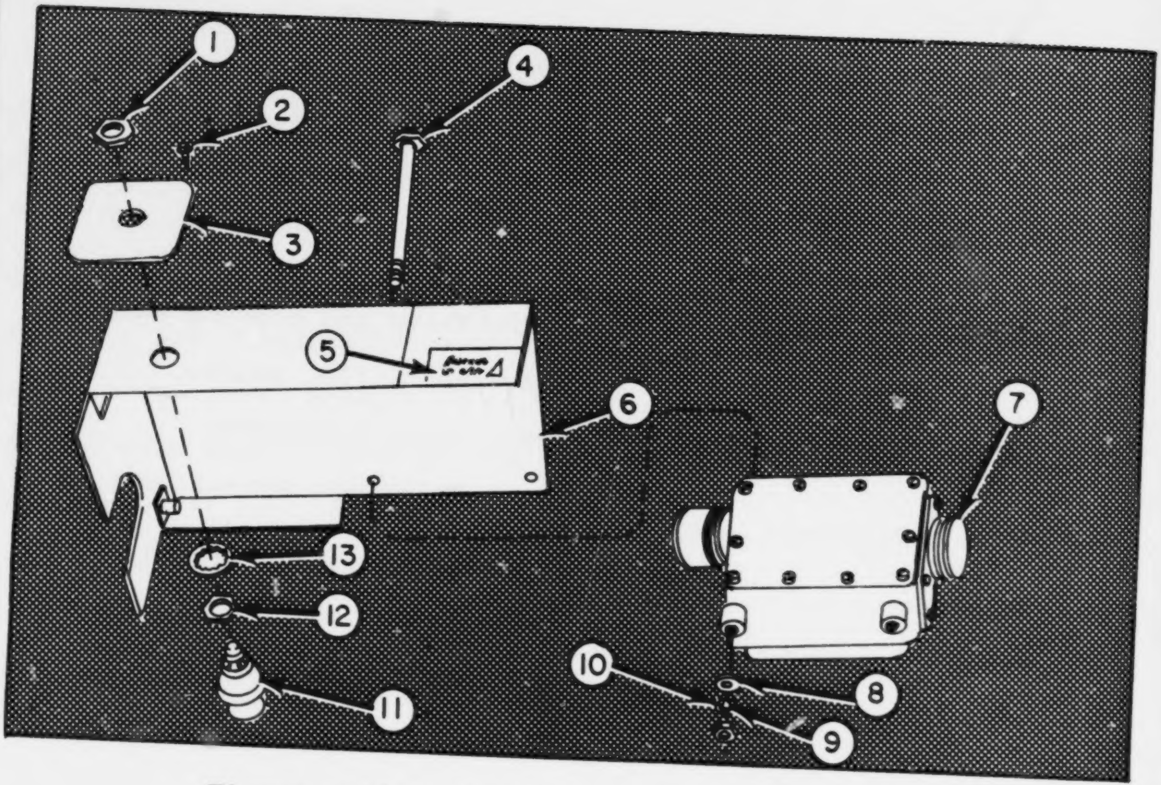
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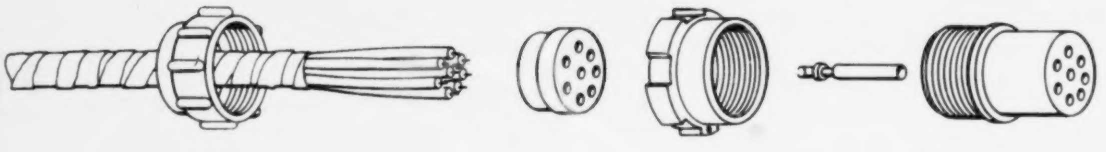
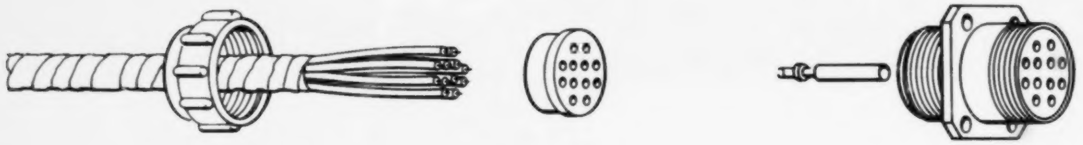
Figure 4-12.1 Control panel, exploded view.

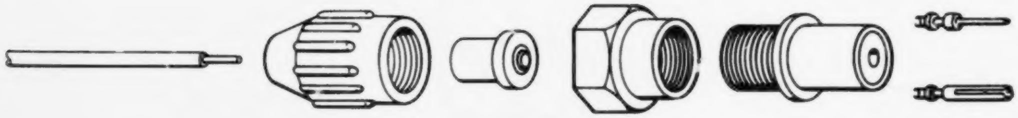
(Generator Sets serial numbers 929-001 thru 929-290)



A–FEMALE-TYPE PLUG ASSEMBLY
1–STRIP LEAD INSULATION EQUAL TO DEPTH OF CONTACT SOCKET SOLDER WELL.
2–REMOVE NUT FROM PLUG ASSEMBLY AND SLIDE OVER CABLE.
3–REMOVE GROMMET FROM PLUG ASSEMBLY.
4–PASS LEAD ENDS THROUGH GROMMET, INSERT INTO CONTACT SOCKET SOLDER WELL, AND SOLDER.
5–SLIDE GROMMET OVER CONTACT SOCKET AND PRESS INTO PLUG ASSEMBLY UNTIL SEATED.
6–THREAD NUT TO PLUG ASSEMBLY.

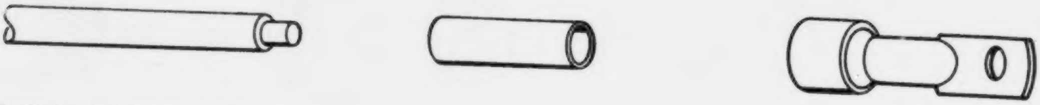


B–FEMALE-TYPE RECEPTACLE ASSEMBLY
1–STRIP LEAD INSULATION EQUAL TO DEPTH OF CONTACT SOCKET SOLDER WELL.
2–REMOVE NUT FROM RECEPTACLE ASSEMBLY AND SLIDE OVER CABLE.
3–REMOVE GROMMET FROM RECEPTACLE ASSEMBLY
4–PASS LEAD ENDS THROUGH GROMMET, INSERT INTO CONTACT SOCKET SOLDER WELLS, AND SOLDER.
5–SLIDE GROMMET OVER CONTACT SOCKETS AND PRESS INTO RECEPTACLE ASSEMBLY UNTIL SEATED.
6–THREAD NUT TO RECEPTACLE ASSEMBLY.

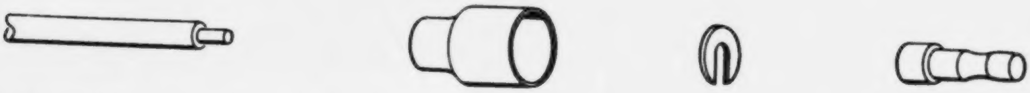


C–FEMALE OR MALE TYPE CONNECTOR ASSEMBLY
1–STRIP LEAD INSULATION EQUAL TO DEPTH OF SOLDER WELL OF CONTACT SOCKET OR CONTACT PIN.
2–REMOVE NUT FROM PLUG ASSEMBLY AND SLIDE OVER CABLE.
3–REMOVE GROMMET FROM PLUG ASSEMBLY.
4–PASS LEAD END THROUGH GROMMET, INSERT INTO SOLDER WELL OF CONTACT SOCKET OR CONTACT PIN, AND SOLDER OR CRIMP.
5–SLIDE GROMMET OVER CONTACT SOCKET OR CONTACT PIN AND PRESS INTO PLUG ASSEMBLY UNTIL SEATED.
6–THREAD RETAINING NUT TO SHELL ASSEMBLY.

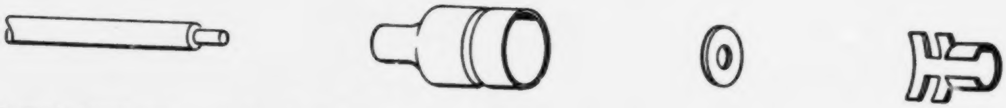
Figure 4-13. Connectors and receptacles.



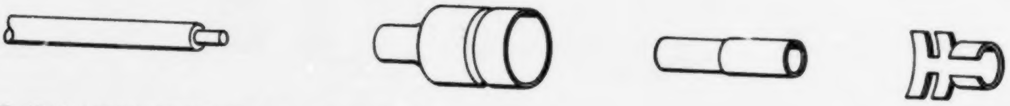
A–TERMINAL-TYPE LEAD CONNECTORS
1–STRIP LEAD INSULATION EQUAL TO DEPTH OF TERMINAL WELL.
2–SLIDE INSULATOR OVER LEAD.
3–INSERT LEAD INTO TERMINAL WELL AND CRIMP.
4–SLIDE INSULATOR OVER CRIMPED END OF TERMINAL.



B–MALE LEAD CONNECTOR
1–STRIP LEAD INSULATION EQUAL TO DEPTH OF FERRULE WELL.
2–SLIDE SHELL OVER LEAD.
3–INSERT LEAD INTO FERRULE WELL AND CRIMP.
4–PLACE "C" WASHER OVER LEAD AT CRIMPED JUNCTION AND SLIDE SHELL OVER "C" WASHER AND TERMINAL.

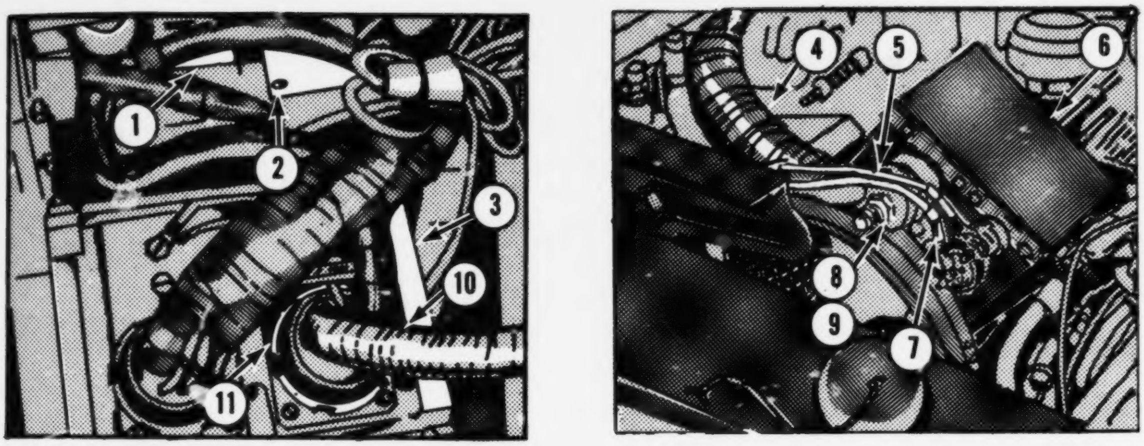


C–FEMALE LEAD CONNECTOR (WITH WASHER)
1–STRIP LEAD INSULATION APPROXIMATELY 1/8 INCH.
2–SLIDE SHELL AND WASHER OVER LEAD.
3–PLACE LEAD ON OPEN EARS OF TERMINAL AND SECURE STRIPPED LEAD END BY FOLDING INNER PAIR OF EARS AND SOLDERING.
4–SECURE INSULATED PORTION OF LEAD BY FOLDING OUTER PAIR OF EARS.
5–SLIDE SHELL AND WASHER OVER TERMINAL.



D–FEMALE LEAD CONNECTOR (WITH SLEEVE)
1–STRIP LEAD INSULATION APPROXIMATELY 1/8 INCH.
2–SLIDE SHELL AND SLEEVE OVER LEAD.
3–PLACE LEAD ON OPEN EARS OF TERMINAL AND SECURE STRIPPED LEAD END BY FOLDING INNER PAIR OF EARS AND SOLDERING.
4–SECURE INSULATED PORTION OF LEAD BY FOLDING OUTER PAIR OF EARS.
5–SLIDE SHELL AND SLEEVE OVER TERMINAL.

Figure 4-14. Wiring harness leads.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A-HARNESS AT REGULATOR

B- HARNESS AT GENERATOR

Figure 4-15. Generator-to-regulator wiring harness.

b. Inspection and Repair. Inspect wires, terminals, and connectors for cracks, breaks, burned areas, and worn or damaged insulation. If wires, terminals, or connectors show any one of these defects, repair wiring harness as described in paragraph 4-32.

c. Installation.

(1) Position wiring harness (10) to generator set and connect regulator generator connector (11) to generator regulator (3).

(2) Connect circuit 478 lead (5), circuit 2 lead (4), and circuit 1 lead (7) to starter-generator (6) and secure with three washers (8) and nuts (9).

(3) Connect relay-to-regulator generator connector lead (1) to relay (2).

Legend for figure 4-15.

1 - Relay-to-regulator generator connector lead
2 - Relay and housing assembly
3 - Generator regulator
4 - Circuit 2 lead
5 - Circuit 478 lead
6 - Start-generator
7 - Circuit 1 lead
8 - Generator lead washer
9 - Generator lead nut
10 - Generator-to-regulator wiring harness
11 - Regulator generator connector

4-36. Power Receptacle Wiring Harness (fig. 4-16).

a. Removal.

(1) Make certain all power is turned OFF.

NOTE

When removing wiring harness, it may be necessary to remove tie-straps. Make certain straps are replaced when wiring harness is installed.

(2) Disconnect regulator battery connector (12) at generator regulator (13).

(3) Disconnect relay-to-regulator battery connector lead (5) at relay (19).

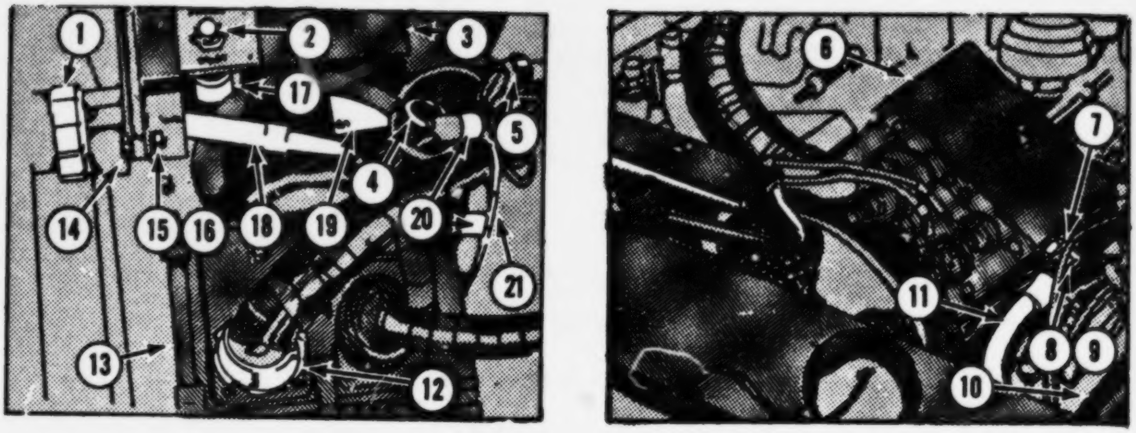
(4) Remove 8 screws (14), nuts (15), and 16 washers (16), and remove 2 power receptacles (1) from control panel (3) and outer frame (10).

(5) Remove nut (8) and three washers (9) and disconnect two circuit 50 leads (11) and ground lead (7) at starter-generator (6).

(6) Disconnect leads (17) at engine start switch (2).

(7) (For generator sets serial numbers 923-001 thru 923-553). Disconnect circuit 950 lead (21) and circuit 950A lead (4) at rheostat connectors (20).

(8) Remove wiring harness (18) from generator set.



A- VOLTAGE REGULATOR
& RECEPTACLE LEADS

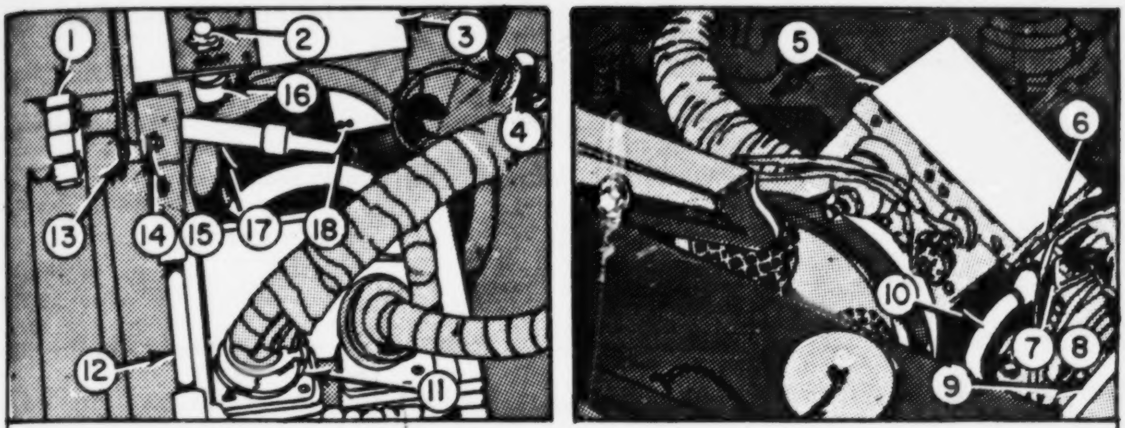
B- STARTER-GENERATOR LEADS

Figure 4-16. Power receptacle wiring harness.

(Generator Sets serial numbers 923-001 thru 923-553)

Legend for figure 4-16.

1 - Power receptacle
2 - Engine start switch
3 - Control panel
4 - Circuit 950A lead
5 - Relay-to-regulator battery connector lead
6 - Start-generator
7 - Generator ground lead
8 - Generator lead nut
9 - Generator lead washer
10 - Outer frame
11 - Circuit 50 lead
12 - Regulator battery connector
13 - Generator regulator
14 - Power receptacle screw
15 - Power receptacle nut
16 - Power receptacle washer
17 - Engine start switch lead
18 - Power receptacle wiring harness
19 - Relay and housing assembly
20 - Rheostat connector
21 - Circuit 950 lead



A - VOLTAGE REGULATOR & RECEPTACLE LEADS

B - STARTER - GENERATOR LEADS

Figure 4-16.1 Power receptacle wiring harness.

(Generator Sets serial numbers 929-001 thru 929-290)

Legend for figure 4-16.1

1 - Power receptacle

2 - Engine start switch

3 - Control panel

4 - Relay-to-regulator battery connector lead

5 - Start-generator

6 - Generator ground lead

7 - Generator lead nut

8 - Generator lead washer

9 - Out frame

10 - Circuit 50 lead

11 - Regulator battery connector

12 - Generator regulator

13 - Power receptacle screw

14 - Power receptacle nut

15 - Power receptacle washer

16 - Engine start switch lead

17 - Power receptacle wiring harness

18 - Relay and housing assembly

b. Inspection and Repair. Inspect wires, terminals, connectors, and receptacles for cracks, breaks, burned areas, and worn or damaged insulation. If wires, terminals, connectors, or receptacles show any one of these defects, repair wiring harness as described in paragraph 4-32.

c. Installation.

(1) Position wiring harness (18) to generator set, and connect relay-to-regulator battery connector lead (5) to relay (19).

(2) Connect leads (17) to engine start switch (2).

(3) Install 2 power receptacles (1) to control panel (3) and outer frame (10) with 16 washers (16), 8 screws (14) and nuts (15).

(4) Connect regulator battery connector (12) to generator regulator (13).

(5) Connect two circuit 50 leads (11) and ground lead (7) to starter-generator (6), and install three washers (9) and nut (8).

(6) (For generator sets serial numbers 923-001 thru 923-553). Connect circuit 950 lead (21) and circuit 950A lead (4) to rheostat connectors (20).

CHAPTER 5

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

5-1. Scope. This chapter contains instructions for direct and general support maintenance of the generator set. It contains procedures for removal, installation, disassembly, assembly, inspection, test, adjustment, and repair of the engine, starter-generator, generator regulator, control panel, and wiring harnesses.

5-2. Repair Parts. Direct and general support maintenance repair parts for the generator set are listed in TM 5-6115-596-24P, which is the authority for requisitioning replacements.

5-3. Special Tools. No special tools and equipment are required by direct and general support maintenance personnel of the generator set.

Section II. SERVICE UPON RECEIPT

5-4. Service Upon Receipt of Material. Refer to paragraph 2-13 for this information.

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

5-5. General. This section contains the table of preventive maintenance checks and services to be performed by direct support and general support personnel.

Table 5-1. Direct Support and General Support Preventive Maintenance Checks and Services

Sequence No.	Item to be Inspected	Procedure	Paragraph Reference
1	Oil seals and oil pan gasket	TM 5-2805-203-14	
2	Compression test	TM 5-2805-203-14	
3	Cylinder heads, exhaust manifolds, and intake manifold	TM 5-2805-203-14	
4	Valve rocker assembly	TM 5-2805-203-14	
5	Oil filter	TM 5-2805-203-14	
6	Governor and control rod	TM 5-2805-203-14	
7	Fuel pump and line	TM 5-2805-203-14	
8	Carburetor	TM 5-2805-203-14	
9	Fuel filter	TM 5-2805-203-14	
10	Spark plugs	TM 5-2805-203-14	
11	Contacts, capacitors, and cam follower.	TM 5-2805-203-14	
12	Brushes	Remove band and inspect brushes for wear. If brushes are worn to groove, replace them.	Figure 5-22
13	Generator output voltage	Check output voltage. For generator sets, serial numbers 923-001 thru 923-553 the output voltage is adjustable.	Para. 5-17
14	Fuel system	Check operation of fuel shutoff valve and replace if defective. Inspect tank for defects and replace if necessary.	5-13 thru 5-16

Section IV. TROUBLESHOOTING PROCEDURES

5-6. General.

a. Scope. This section contains information for direct and general support maintenance personnel to use in conjunction with and as supplement to the troubleshooting contained in paragraphs 4-8 through 4-10.

b. Purpose. Operation of a deadlined generator set without a preliminary examination can cause further damage to a disabled component and possible injury to personnel. By careful inspection and troubleshooting, such damage and injury can be avoided, and in addition the causes of faulty operation of a set or component can often be determined without extensive disassembly.

5-7. Inspection.

a. General. Inspection and troubleshooting are performed either while a disabled component is still mounted in the generator set or after it has been removed.

b. Component Mounted. Inspection made with the component mounted in the set is for the most part visual and is performed before attempting to operate the set. The object of this inspection is to determine the condition of the component and, if found defective, to take precautions to prevent any further damage.

c. Component Removed. Inspection made after the component is removed from the set verifies the diagnosis made when the component was in the set, uncovers further defects, or determines malfunctions if the component alone is received by the direct support maintenance unit. This inspection is particularly important in the last case because it is often the only means of determining the malfunction without completely disassembling the component.

5-8. Troubleshooting.

Table 5-3 lists malfunctions or warning symptoms of trouble that may develop in the generator set components covered in this chapter. Each malfunction is followed by a list of probable causes or tests that must be considered in determining the corrective action necessary to remedy the malfunction or symptom.

Table 5-2. Symptom Index

Malfunction	Reference Paragraph
1. Brushes move excessively	5-22, 5-23
2. Brushes spark excessively	5-20, 5-23, 5-25
3. Engine malfunctions	TM 5-2805-203-14
4. Generator does not operate as starter	4-10, 5-28 thru 5-32
5. Generator fails to operate	4-10
6. Generator has no output	5-20, 5-23, 5-28 thru 5-32
7. Generator has no output or low output	5-20, 5-22, 5-25
8. Generator voltage output is low	4-10, 5-17, 5-27 thru 5-32
9. Generator overheats	5-20, 5-21
10. Generator produces reverse polarity	5-20, 5-22, 5-24
11. Generator set vibrates excessively	4-12, 5-10, 5-11, 5-19

Table 5-3. Direct and General Support Troubleshooting

Malfunctions (symptoms)	Probable causes (tests)	Corrective Action (remedies)
	ENGINE	
1. All engine malfunctions	All probable causes	Refer to TM 5-2805-203-14.
2. Generator set vibrates excessively while engine is running.	a. Loose or worn engine drive sheave	a. Tighten or replace sheave (para. 5-11).
	b. Loose or worn starter-generator drive sheave	b. Tighten or replace sheave (para. 5-19).
	c. Broken or loose engine mounting screw.	c. Tighten or replace screw (para. 4-12 and 5-10).
	GENERATOR	
3. No generator output	a. Brushes making poor contact with commutator.	a. Replace brushes (para. 5-20) and recondition commutator if necessary (para. 5-23b).
	b. Defective generator regulator.	b. Repair regulator (the regulators in generator sets with serial numbers 923-001 thru 923-553 are repairable) or replace regulator (para. 5-28 thru 5-32).
	c. Short-circuited or grounded armature.	c. Replace armature (para. 5-20).
	d. Overvoltage breaker on regulator activated (generator sets serial numbers 929-001 thru 929-290).	d. Press reset button on regulator.

Table 5-3. Direct and General Support Troubleshooting (Continued)

Malfunctions (symptoms)	Probable causes (tests)	Corrective Action (remedies)
4. Generator has no output or output is very low.	a. Brushes making poor contact with commutator.	a. Replace brushes if approaching their minimum length (para. 5-22c). Seat and run-in brushes (para. 5-25).
	b. Short circuited or grounded armature.	b. Replace armature (para. 5-20).
	c. Reversed polarity in electrical system.	c. Make certain positive contacts are connected to positive contacts and negative contacts to negative contacts.
5. Generator produces full voltage with reverse polarity.	a. Unproperly connected brushes.	a. Connect brushes properly (para. 5-24).
	b. Defective housing assembly.	b. Check for defective housing (para. 5-22e). Replace defective housing (para. 5-20).
6. Generator produces low output voltage.	a. Rheostat out of adjustment (generator sets, serial numbers 923-001 thru 923-553).	a. Adjust rheostat (para. 5-17a).
	b. Defective generator regulator.	b. On sets, serial numbers 923-001 thru 923-553, regulators may be repaired. On sets, serial numbers 929-001 thru 929-290, defective regulators must be replaced (para. 5-28 thru 5-32).

Table 5-3. Direct and General Support Troubleshooting (Continued)

Malfunction (symptoms)	Probable causes (tests)	Corrective Action (remedies)
6. Continued	c. Defective rheostat (generator sets 923-001 thru 923-553).	c. Check for defective rheostat (para. 4-10). Replace defective rheostat (4-27 through 4-30).
	d. Brushes making poor contact with commutator.	d. Replace brushes if approaching their minimum length (para. 5-22c). Seat and run-in brushes (para. 5-25).
	e. Short-circuited armature.	e. Replace armature (para. 5-25).
	f. Short-circuited or grounded field windings.	f. Replace housing (para. 5-20).
7. Excessive sparking at brushes.	a. Brushes not properly seated on commutator.	a. Seat and run-in brushes (para. 5-25).
	b. Open-circuited or short-circuited armature.	b. Replace armature (para. 5-20).
	c. Short-circuited field winding.	c. Replace housing (para. 5-23).
	d. Pitted or eccentric commutator.	d. Resurface commutator (para. 5-23b).
	e. Worn ball bearings.	e. Replace ball bearings (para. 5-20).
8. Generator overheats.	a. Obstruction in air passages.	a. Disassemble and clean generator (para. 5-20 and 5-21).
	b. Broken cooling fan.	b. Replace cooling fan (para. 5-20).
	c. Grounded insulated brush.	c. Replace insulated tube (para. 5-20).
	d. Open armature winding.	d. Replace armature (para. 5-20).

Table 5-3. Direct and General Support Troubleshooting (Continued)

Malfunctions (symptoms)	Probable causes (tests)	Corrective Action (remedies)
9. Excessive brush movement.	a. Worn or out-of-round commutator. b. Broken or weak brush spring.	a. Repair commutator (para. 5-23). b. Check brush spring for proper tension (para. 5-22d). Replace brushes that are out of tolerance (para. 5-22c).
10. Generator does not operate as starter, but operates properly as generator.	a. Defective generator regulator.	a. Check electrical continuity of regulator (para. 4-10). Replace or repair defective regulator (para. 5-28 through 5-32).
	b. Defective starting relay.	b. Check electrical continuity of relay (para. 4-10). Replace defective relay (para. 4-28 through 4-31).
	c. Defective engine start switch.	c. Check electrical continuity of start switch (para. 4-10). Replace defective switch (para. 4-28 through 4-31).
11. Generator fails to operate.	a. Defective generator regulator. b. Defective start switch. c. Defective relay.	a. Refer to para. 4-10. b. Refer to para. 4-10. c. Refer to para. 4-10.

Section V. ENGINE MAINTENANCE PROCEDURES

5-9. General.

This section contains instructions for removal, installation, and inspection after installation of the engine. Also covered in this section is the installation of the engine belt drive sheave and adapter.

5-10. Engine (fig. 5-1).

a. Removal.

(1) Make certain all power is turned OFF.

(2) Close fuel shutoff valve (par. 2-5).

(3) Disconnect spring (17) from lifting bracket (18).

(4) Remove two screws (3), spacers (5), and washers (4), and remove lifting bracket and washers (2) from outer frame (6).

(5) Remove two screws (19) and four washers (20), and remove frame tube (1) and washers (2) from frame.

(6) Disconnect fuel tank-to-fuel shutoff valve hose (16) at valve connector (25).

(7) Remove starter-generator drive belts (par. 4-22).

(8) Remove screw (22) and two washers (23) securing drive belt brace (15) to starter-generator (24).

(9) Remove mufflers (par. 4-20).

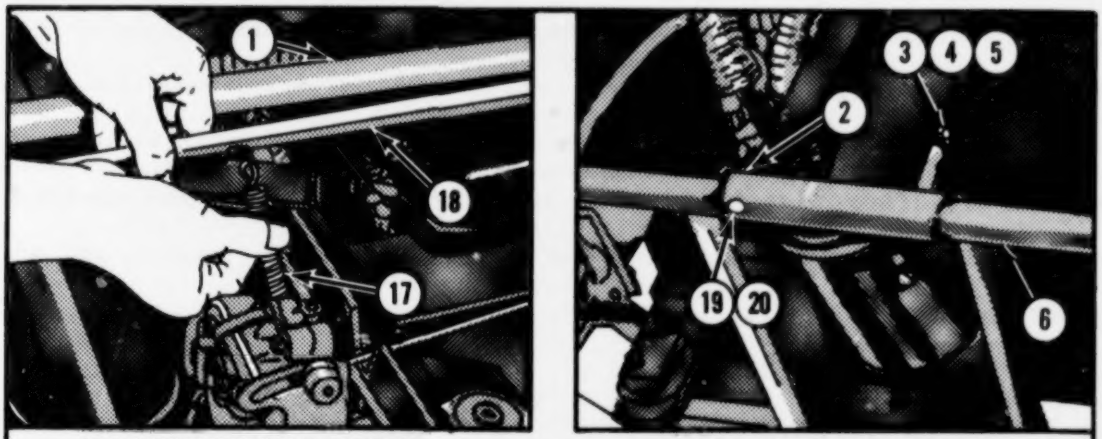
(10) Loosen screw (7), and move bracket (21) away from rear exhaust manifold (8).

(11) Remove 6 screws (9) and 12 washers (10), and remove engine (11) from inner frame (12).

(12) If replacement engine is to be installed, remove:

(a) Fuel filter-to-fuel pump hose (par. 4-18).

(b) Fuel filter with shutoff valve (par. 4-17).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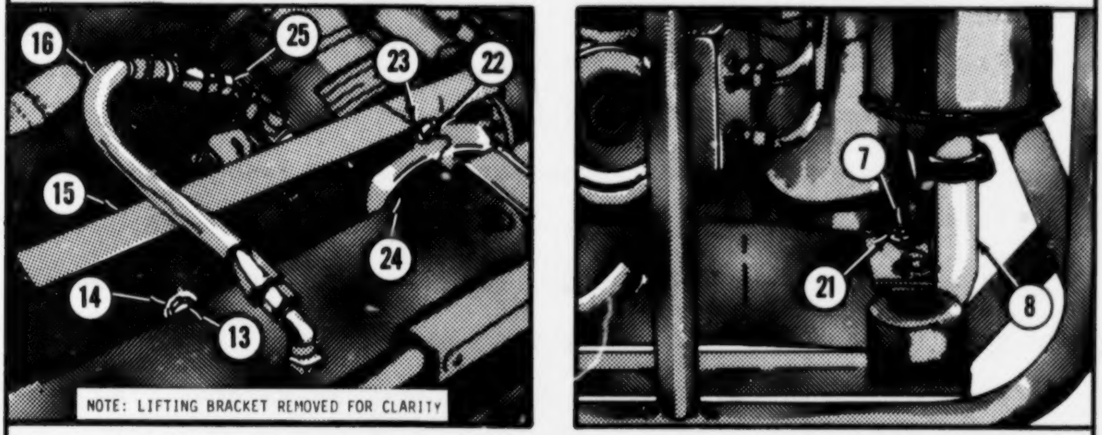
3 4 5
2
19 20
6

A- LIFTING BRACKET SPRING

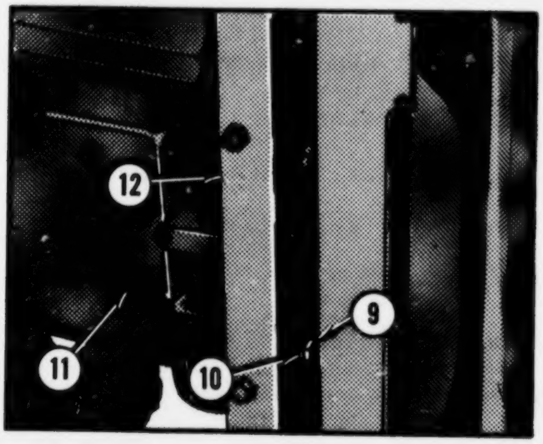
B-LIFTING BRACKET SCREWS


16
25
23
22
15
24
14
13
7
21
8

NOTE: LIFTING BRACKET REMOVED FOR CLARITY

C- DRIVE BELT BRACE AND FUEL HOSE

D- MANIFOLD BRACKET



E- ENGINE SCREWS

Figure 5-1. Engine removal points.

Legend for figure 5-1:

1 - Removable frame tube
2 - Frame tube shim washer
3 - Lifting bracket screw
4 - Lifting bracket washer
5 - Lifting bracket spacer
6 - Outer frame
7 - Manifold bracket screw
8 - Exhaust manifold, rear
9 - Engine securing screw
10 - Engine washer
11 - Engine
12 - Inner frame
13 - Drive belt brace screw
14 - Drive belt brace washer
15 - Drive belt brace
16 - Fuel tank-to-fuel shutoff valve hose
17 - Lifting bracket stowage spring
18 - Lifting bracket
19 - Frame tube screw
20 - Frame tube washer
21 - Exhaust manifold bracket
22 - Drive belt brace adjusting screw
23 - Drive belt brace adjusting washer
24 - Starter-generator
25 - Shutoff valve hose connector

(c) Two screws (13) and washers (14) securing drive belt brace to engine, and brace.

b. Installation.

(1) If replacement engine is to be installed, reinstall:

(a) Drive belt brace (15) to engine (11) with two washers (14) and screws (13).

(b) Fuel filter with shutoff valve (par. 4-17).

(c) Fuel filter-to-fuel pump hose (par. 4-18).

(2) Position engine to inner frame (12) and secure with 12 washers (10) and 6 screws (9).

(3) Position bracket (21) to rear exhaust manifold (8), and tighten screw (7).

(4) Install mufflers (par. 4-20).

(5) Loosely install drive belt brace to starter-generator (24) with two washers (23) and screw (22).

(6) Install and adjust starter-generator drive belts (par. 4-23).

(7) Connect fuel tank-to-fuel shutoff valve hose (16) to valve connector (25).

(8) Position frame tube (1) to outer frame (6), add shim washers (2) as required to maintain a gap of ½ washer thickness between both ends of tube and frame.

(9) Secure tube to frame with four washers (20) and two screws (19).

(10) Position lifting bracket (18) to frame, and add shim washers (2) as required to maintain a gap of one washer between bracket and frame at both ends of bracket.

(11) Secure lifting bracket to frame with two spacers (5), washers (4), and screws (3).

(12) Connect spring (17) to lifting bracket.

NOTE

Record on DA Form 2408-3 (Equipment Maintenance Record) if replacement engine has been installed.

c. Inspection After Installation.

(1) Check oil level in engine as prescribed in LO 5-2805-203-14

(2) Check electrical connections to make certain they are tight and secure.

(3) Check for lubricant and fuel leaks. Make certain all connections are secure.

5-11. Engine Belt Drive Sheave and Adapter (fig. 5-2).

a. Removal.

(1) Remove two setscrews retaining bushing and sheave to shaft of adapter.

(2) Using one setscrew as jack screw in threaded puller hole, tighten and push sheave from bushing.

(3) Remove jack screw, sheave, bushing, and key from adapter.

(4) Remove four screws and washers, and remove adapter from engine.

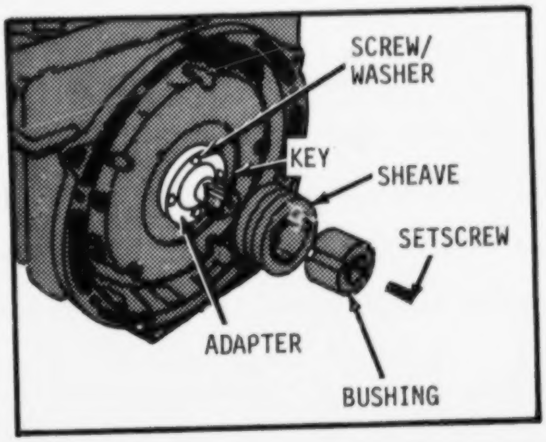


Figure 5-2. Engine belt drive sheave and adapter — exploded view.

b. Inspection and Repair.

(1) Inspect bores and mounting surfaces on sheave, bushing, and adapter for wear, grooves, nicks, and scratches. Remove scratches and nicks. Replace parts if damage is beyond repair.

(2) Inspect threaded parts for burred or damaged threads. Remove burrs or replace parts.

c. Installation.

(1) Position adapter to engine and secure with four washers and screws.

(2) Install key, bushing and sheave on shaft of adapter.

(3) Secure sheave and bushing to shaft of adapter with two setscrews.

Section VI. FUEL TANK MAINTENANCE PROCEDURES

5-12. General.

a. Scope. This section contains instructions for removal, testing, and installation (replacement) of the fuel tank.

5-13. Fuel Tank Removal (fig. 5-3).

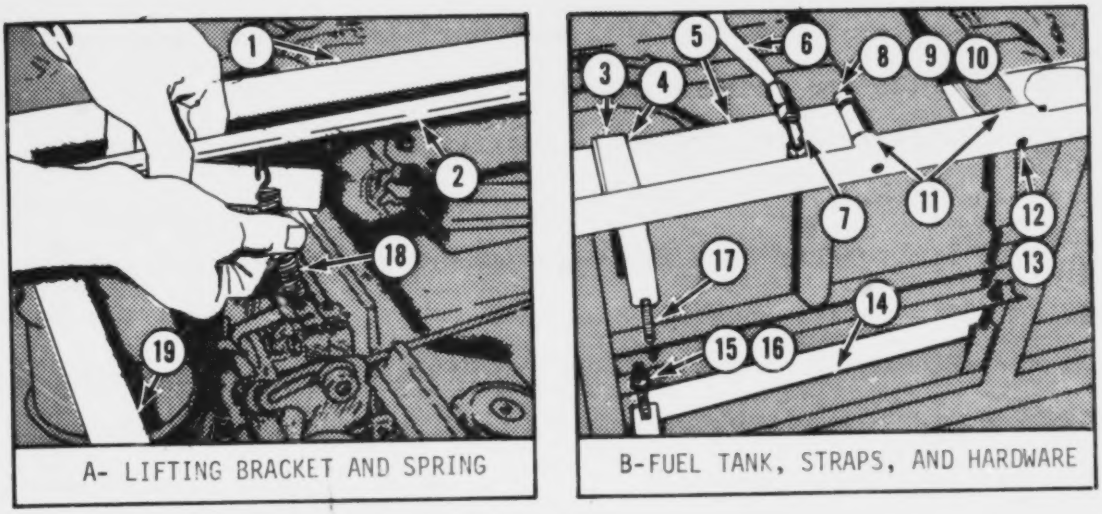
a. Removal.

(1) Make certain all power is turned OFF.

(2) Drain fuel tank (par. 4-15).

(3) Disconnect spring (18) from lifting bracket (2).

(4) Remove two screws (8), spacers (9), and washers (10), and remove lifting bracket and washers (11) from outer frame (19).



A- LIFTING BRACKET AND SPRING

B-FUEL TANK, STRAPS, AND HARDWARE

Figure 5-3. Fuel tank.

Legend for figure 5-3.

1 - Removable frame tube

2 - Lifting bracket

3 - Tank strap

4 - Top resilient pad

5 - Fuel tank

6 - Fuel tank-to-fuel shut-off valve hose

7 - Fuel tank outlet elbow

8 - Lifting bracket screw

9 - Lifting bracket spacer

10 - Lifting bracket washer

11 - Shim washer

12 - Frame tube screw

13 - Frame tube washer

14 - Bottom resilient pad

15 - Strap nut

16 - Strap washer

17 - Strap tee bolt

18 - Lifting bracket stowage spring

19 - Outer frame

(5) Remove two screws (12) and four washers (13), and remove frame tube (1) and washers (11) from frame.

(6) Disconnect fuel tank-to-fuel shutoff valve hose (6) from fuel tank elbow (7).

(7) Remove four nuts (15) and washers (16), and remove two straps (3) securing tank (5) to frame.

(8) Remove two top resilient pads (4) and bottom resilient pad (14) from tank.

(9) Lift tank from unit.

5-14. Testing Fuel Tank.

a. Test.

(1) Before performing any tests on fuel tank, complete fuel tank inspections as indicated in paragraph 4-16.

(2) Replace tank if any defects are apparent in step (1) through (4) as indicated in paragraph 4-16.

(3) To determine if tank leaks, pressurize tank to 2 psi for 20 minutes. Replace tank if pressure subsides.

CAUTION

Do not apply more than 2.5 psi
pressure to tank.

5-15. Installation (Replacement) of Fuel Tank (fig. 5-3).

a. Installation.

(1) Position fuel tank (5) to outer frame (19).

(2) Position two straps (3) to tank, and aline four strap tee bolts (17) to frame.

(3) Loosely install four washers (16) and nuts (15) to hold straps in place.

(4) Install two top resilient pads (4) and bottom resilient pad (14) to tank, and tighten strap nuts (15).

(5) Connect fuel tank-to-fuel shutoff valve hose (6) to fuel tank elbow (7).

(6) Position frame tube (1) to frame, and add shim washers (11) as required to maintain a gap of ½ washer thickness between tube and frame at both ends of tube.

(7) Secure tube to frame with four washers (13) and two screws (12).

(8) Position lifting bracket (2) to frame, and add shim washers (11) as required to maintain a gap of one washer thickness between bracket and frame at both ends of bracket.

(9) Secure lifting bracket to frame with two spacers (9), washers (10), and screws (8).

(10) Connect spring (18) to lifting bracket.

(11) Fill fuel tank, start engines, and check for fuel leakage.

Section VII. STARTER-GENERATOR MAINTENANCE PROCEDURES

5-16. General.

a. Scope. This section contains instructions for adjustment of generator voltage, removal, inspection, repair, and installation of the starter-generator belt drive sheave and bushing. This section also contains instructions for disassembly, cleaning, inspection, repair, and assembly of the starter-generator.

b. Description. The starter-generator is a six-pole, six-brush unit equipped with a three-capacitor radio noise box. Self-air-induction is obtained by a fan at the commutator end driving air across the armature and field coils.

5-17. Adjustment of Generator Voltage (fig. 5-4).

a. This procedure applies ONLY to generator sets serial numbers 923-001 thru 923-553. The solid-state regulator in serial numbers 929-001 thru 929-290 delivers an output voltage that is non-adjustable. In the event the output voltage becomes excessive, the regulator automatically removes output power. When the condition that caused this overvoltage is corrected, depressing a reset button mounted on the regulator will restore output power.

b. Adjustment.

(1) Test specific gravity of battery source. Batteries must be functioning properly to adjust voltage. Refer to TM 9-6140-200-14 for information on batteries.

(2) Start engine, and place load (para. 2-14d) across batteries until generator and regulator reach operating temperature.

(3) Connect voltmeter across battery terminals.

(4) Remove rheostat and turn knob until voltmeter reads 27.5 volts.

5-18. Removal of Starter-Generator (fig. 5-5).

a. Removal.

(1) Make certain all power is turned OFF.

(2) Remove three nuts (14) and washers (15), and disconnect circuit 1 lead (13), circuit 2 lead (2), and circuit 478 lead (3) at generator.

(3) Remove nut (10) and three washers (12) and disconnect two circuit 50 leads (11) and ground lead (4) at generator.

(4) Remove generator drive belts (para. 4-23).

(5) Remove screw (17) and two washers (1) securing drive belt brace (16) to generator.

(6) Remove two screws (8) and four washers (7) and remove generator from inner frame (9).

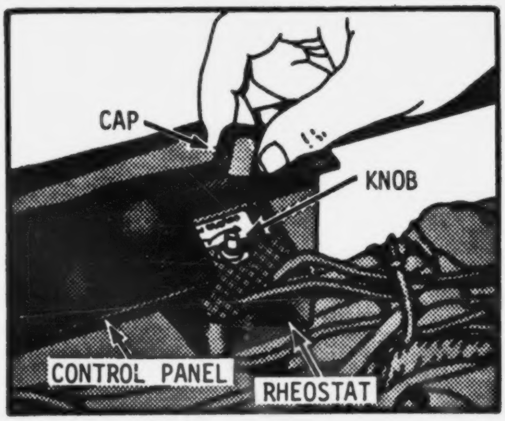
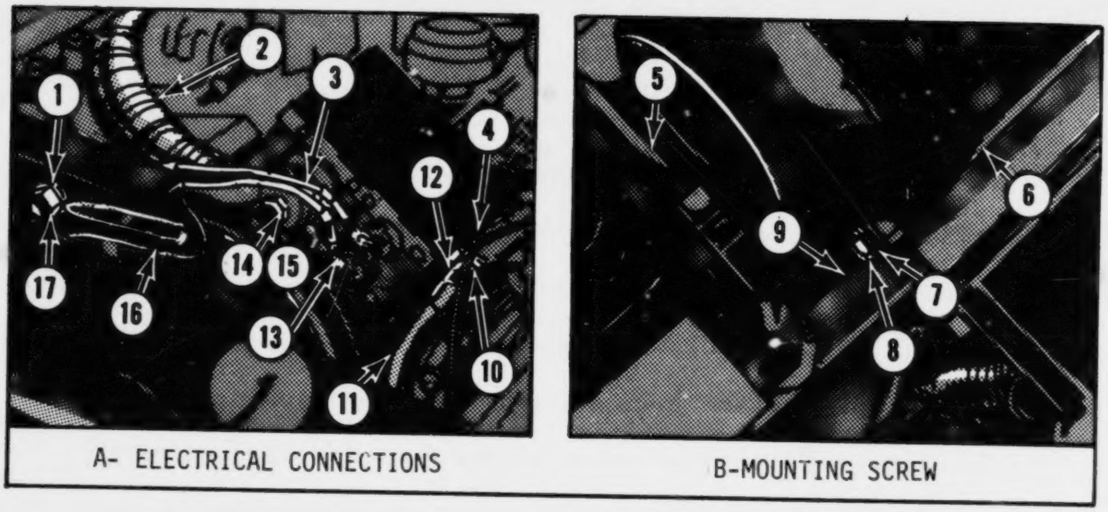


Figure 5-4. Adjusting generator voltage.



A- ELECTRICAL CONNECTIONS

B-MOUNTING SCREW

Figure 5-5. Starter-generator removal points.

Legend for Figure 5-5.

1 - Drive belt brace washer

2 - Circuit 2 lead

3 - Circuit 478 lead

4 - Ground lead

5 - Voltage regulator

6 - Starter-generator band

7 - Starter-generator washer

8 - Starter-generator screw

9 - Inner frame

10 - Circuit lead nut

11 - Circuit 50 lead

12 - Circuit lead washer

13 - Circuit 1 lead

14 - Circuit lead nut

15 - Circuit lead washer

16 - Generator drive belt brace

17 - Drive belt brace screw

b. Inspection and Repair. Check starter-generator as described in electrical troubleshooting (par. 4-10). Replace generator if defective.

c. Installation.

(1) Position generator to inner frame (9), and loosely install four washers (7) and two screws (8).

(2) Loosely install two washers (1) and screw (17) securing drive belt brace (16) to generator.

(3) Install drive belts (par. 4-23).

(4) Connect two circuit 50 leads (11) and ground lead (4) to generator, and install three washers (12) and nut (10).

(5) Connect circuit 478 lead (3), circuit 2 lead (2), and circuit 1 lead (13) to generator, and install three washers (15) and nuts (14).

NOTE

Record on DA Form 2408-3 (Equipment Maintenance Record) if replacement generator-starter has been installed.

5-19. Removal and Installation of Starter-Generator Belt Drive Sheave and Bushing (fig. 5-6).

a. Removal.

(1) Remove two setscrews retaining bushing and sheave to drive shaft of generator.

(2) Using one setscrew as jack screw in threaded puller hole, tighten and push sheave from bushing.

(3) Remove jack screw, sheave, bushing, and key from drive shaft of generator.

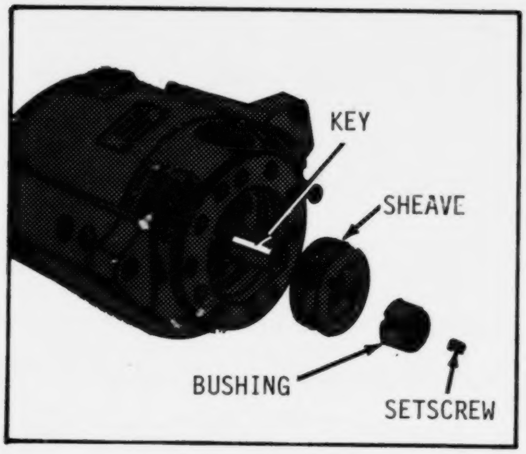

KEY
SHEAVE
BUSHING
SETSCREW

Figure 5-6. Starter-generator belt drive sheave and bushing-exploded view.

b. Inspection and Repair.

(1) Inspect bores and mounting surfaces on sheave and bushing for wear, grooves, nicks, and scratches. Remove scratches and nicks. Replace parts if damage is beyond repair.

(2) Inspect threaded parts for burred or damaged threads. Remove burrs or replace parts.

c. Installation.

(1) Install key, bushing, and sheave on drive shaft of generator.

(2) Secure sheave and bushing to shaft with two setscrews.

5-20. Disassembly of Starter-Generator (fig. 5-7).

CAUTION

> When handling generator parts, exercise care to avoid damaging them. Nicks, dents, or scratches from careless handling may cause subsequent failure.

a. Place scribe mark across generator housing (14), brush cover band (15), bearing and brush support (18), and fan cover (25) so components can be alined in the same position when assembled.

b. Remove eight screws (9) and washers (8), and remove cover (7) from radio-noise suppression filter housing (13).

c. Remove two nuts (1) and washers (2), and disconnect circuit A lead (35) and circuit D lead (36) at two-pole capacitor (3).

d. Remove two nuts (30), screws (6), and washers (29), and disconnect ground strap (32) and one-pole capacitor (31) at generator terminals (34).

e. Remove four screws (10) and washers (12), and remove filter housing from generator housing.

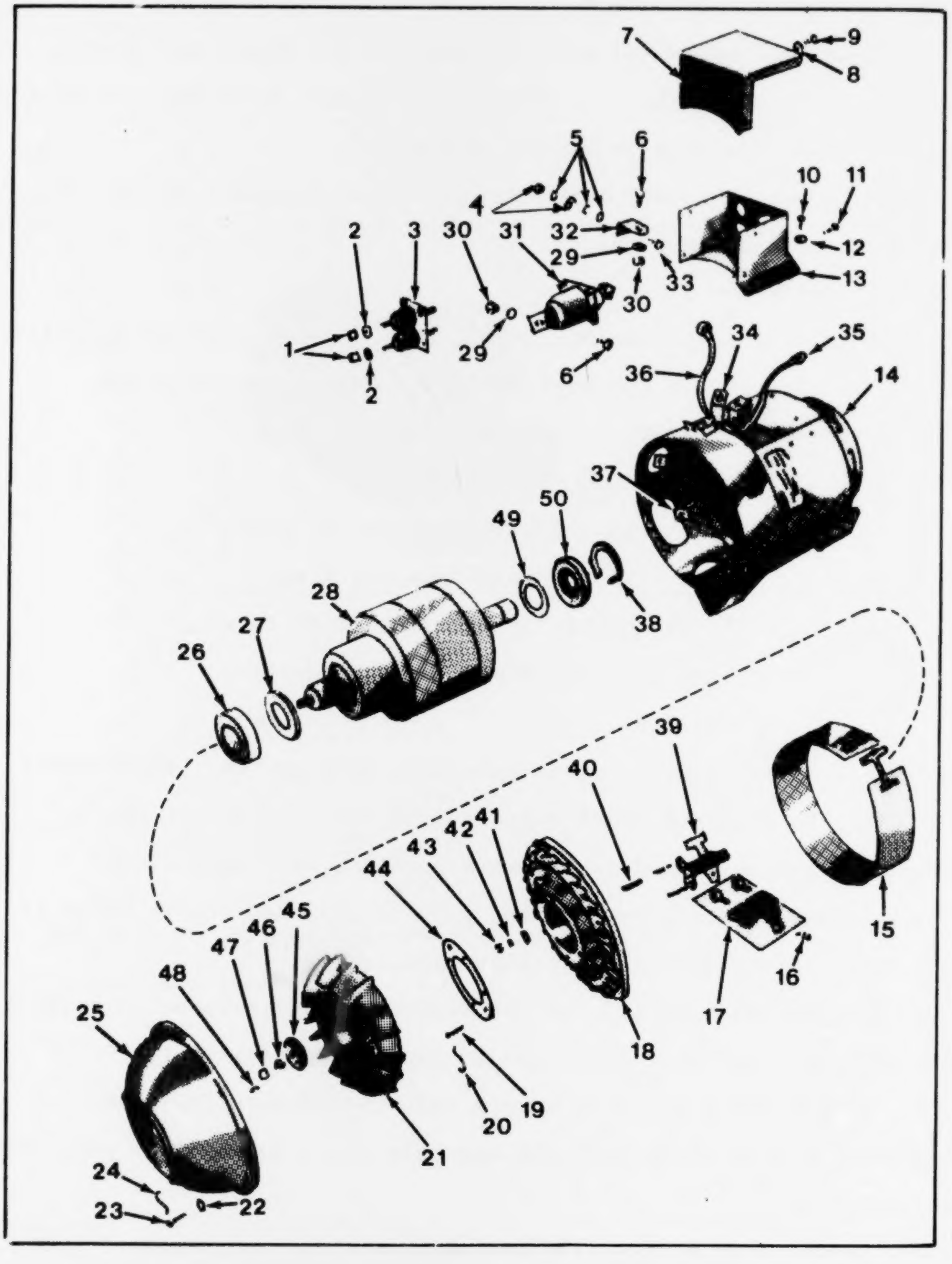

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Figure 5-7. Starter-generator — exploded view.

Legend for figure 5-7.

1 - Capacitor lead nut
2 - Capacitor washer
3 - Two-pole capacitor
4 - Ground strap nut
5 - Ground strap washer
6 - Terminal screw
7 - Radio-noise suppression filter cover
8 - Filter cover washer
9 - Filter cover screw
10 - Filter housing screw
11 - Capacitor screw
12 - Filter housing washer
13 - Radio-noise suppression filter housing
14 - Generator housing
15 - Brush cover band
16 - Brush terminal screw
17 - Brush assembly
18 - Bearing and brush support
19 - Bearing retainer screw
20 - Bearing retainer lockwire
21 - Fan
22 - Fan cover washer
23 - Fan cover screw
24 - Fan cover lockwire
25 - Fan cover
26 - Commutator— end ball bearing
27 - Support baffle
28 - Armature
29 - Terminal washer
30 - Terminal nut
31 - One-pole capacitor
32 - Ground strap
33 - Ground strap screw
34 - Generator terminal
35 - Circuit A lead
36 - Circuit D lead
37 - Generator brush terminal
38 - Armature bearing snap ring
39 - Brush holder
40 - Brush holder tube
41 - Brush holder insulating washer
42 - Brush holder flat washer
43 - Brush holder nut
44 - Brush support retainer
45 - Fan washer
46 - Fan inner nut
47 - Fan outer nut
48 - Fan key
49 - Armature baffle
50 - Armature bearing

f. Remove two screws (11), and remove capacitor (3) from filter housing

g. Remove two screws (11), and remove capacitor (31) from filter housing.

h. Remove screw (33), two nuts (4), and three washers (5), and remove ground strap (32) from filter housing.

i. Loosen screw on brush covers band (15), and remove band from generator housing.

j. Remove lockwire (24) between each two screws, 12 screws (23), and washers (22), and remove fan cover (25) from generator housing. Discard lockwire.

k. Remove fan outer nut (47) and fan inner nut (46), and remove fan washer (45) and fan (21) from armature (28).

l. Remove lockwire, (20) between each two screws and six screws (19), and remove brush support retainer (44) from bearing and brush support (18). Discard lockwire.

m. Remove six screws (16), and disconnect six brush assemblies (17) from generator brush terminals (37).

n. Remove armature (28) with bearing and brush support (18) from generator housing (14).

o. Remove six brush assemblies from support.

p. Remove key (48) from shaft of armature, and remove support baffle (27) from armature.

q. Press on outside race of commutator-end ball bearing (26), and separate bearing from support.

NOTE

Do not follow r below unless inspection indicates otherwise.

r. Remove 12 nuts (43), flat washers (42), and insulating washers (41), and remove 6 brush holders (39) and 12 tubes (40) from support.

s. Remove snap ring (38) from shaft of armature.

t. Press on inside race of armature bearing (50), and remove bearing and baffle (49) from shaft of armature.

5-21. Cleaning.

a. General. After completely disassembling the generator, clean all parts, except ball bearings, brushes, capacitors, and the basic generator housing (which contains the field coils) using mineral spirits paint thinner or drycleaning solvent. Immerse all parts, except those noted above, in solvent and brush with a soft bristle brush to remove stubborn accumulations that cannot be rinsed away by dipping. After cleaning, dry parts with compressed air, and place in a clean dust-free location until ready for assembly. Refer to C6800IL for information on cleaning of Army materiel.

CAUTION

Do not allow parts to remain in cleaning solvent more than 30 seconds: continued contact with solvent tends to soften protective coatings on some parts.

b. Generator Housing. Clean generator housing, including field coils, by brushing between coils with soft bristle brush to loosen dust and other accumulations. After brushing, use compressed air to dislodge and remove all loosened material. Clean outer surfaces by wiping with cloth moistened in mineral spirits paint thinner or drycleaning solvent.

c. Ball Bearings. Clean bearings using dry cleaning solvent, Fed. Spec. P-D-680 and dry thoroughly.

d. Brushes. Always replace brushes when generator is completely disassembled.

CAUTION

Do not use carbon tetrachloride for cleaning any part of generator: use of this chemical can cause severe damage to brushes and commutator.

5-22. Inspection.

a. General.

(1) Before disassembly. Inspect generator before disassembly or before tests are performed to eliminate any possibility of further damage. Rotate armature by hand to make certain it is free. If armature rotates freely, remove brush cover band and inspect brushes and commutator.

(2) During disassembly.

(a) Inspect all bolts, screws, and nuts for worn or damaged threads. Replace lockwashers and lockwires. Do not use safety devices a second time.

(b) Visually inspect housing parts, support, fan, drive shaft part of armature, and other internal parts for damage such as cracks, burned insulation, corrosion, rust, and other damage that can be detected by visual inspection. Replace all damaged or defective parts.

b. Armature.

(1) Inspect brush contact surface of armature. A highly burnished, dark-copper color indicates satisfactory condition. If contact surface is rough, pitted, scored, burned in areas, or coated with hardened varnish or carbon accumulations, resurface commutator (par. 5-23). A short circuited or open-circuited armature coil leaves adjacent commutator bars burned or extremely dark in color. Check for shorts or openings with test lamp (fig. 5-8) and with growler (5-9). If test indicates short-circuit, carefully inspect between commutator bars for copper particles or a carbon bridge. If test and inspection indicate faulty armature coil, replace armature.

(2) If a series of defective commutator bars show burns, trouble may be due to eccentricity or grease deposits on surfaces. If burned areas are caused by grease deposits, clean and resurface commutator (par. 5-23). If burned areas are caused by eccentricity, mount armature on its bearings (not on shaft centers), and check concentricity. Eccentricity should not exceed 0.0002 inch bar-to-bar or 0.001 inch total runout. If test indicates eccentric commutator, resurface commutor (par. 5-23).

(3) Check soldering between commutator and conductors on armature. If "solder throwing" is indicated, resolder armature before continuing inspection.

(4) If generator armature is in good condition, bake it in dry oven from 2 to 4 hours at 193°F (89.5°C) to remove all traces of moisture.

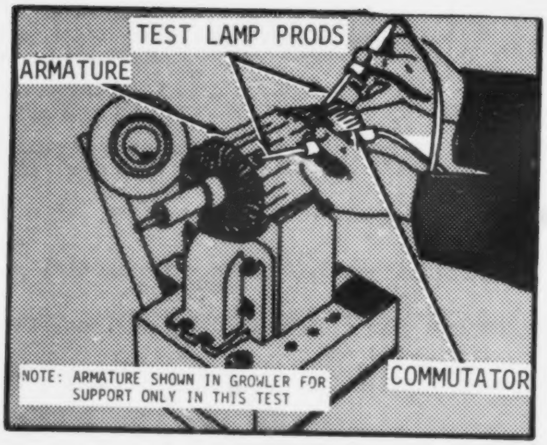
TEST LAMP PRODS
ARMATURE
COMMUTATOR
NOTE: ARMATURE SHOWN IN GROWLER FOR SUPPORT ONLY IN THIS TEST

Figure 5-8. Testing armature for grounds.

(5) Check for a grounded armature with 220-volt ac or dc line and 50-watt lamp connected in series (fig. 5-8). When 220-volt source is not available, use 110-volt source. Touch one test prod to armature core and simultaneously touch other prod to one commutator bar. If lamp lights, armature is grounded; replace grounded armature. Test all commutator bars in this manner.

WARNING

Exercise care when using a 220-volt current: bodily injury may result under certain conditions. Do not use voltage in excess of 220 volts for any of these tests.

(6) Place armature assembly on growler, and hold thin strip of steel, such as a hacksaw blade, approximately 1/16-inch away from armature core (fig. 5-9). Rotate armature slowly in growler. If steel strip vibrates, winding is short circuited; replace shorted armature.

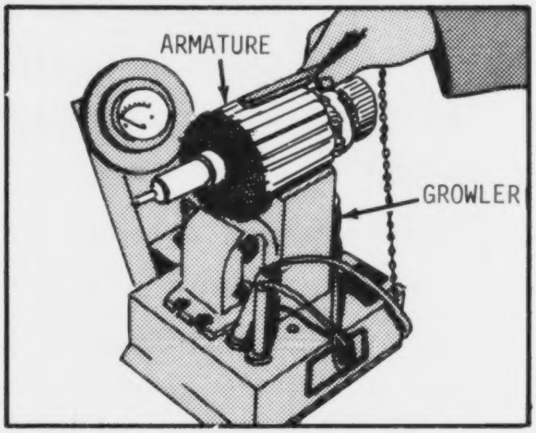

Figure 5-9. Testing armature for short circuits.

c. Brushes. If brushes are worn to lateral wear groove in edge of brush (maximum wear allowable), replace brushes in sets. If brushes are approaching wear groove when generator is received for repair, replace brushes to extend operation time after repairs before replacement is again necessary.

d. Brush Springs. Check brush springs for distortion and cracks. Check brush spring tension as shown in figure 5-10. Spring tension is between 45 and 54 ounces when spring is in position with a new brush installed. Replace springs that are distorted, cracked, or not within tension tolerances.

e. Generator Housing Assembly .

(1) Visually inspect generator housing assembly, making certain that pole shoe attaching screws are tight and staked.

(2) Inspect external insulation of field coils. If insulation is burned or cracked, or if coils show signs of mechanical damage, replace entire housing assembly.

(3) To test for short circuits, use same test circuit equipment used for testing armature (fig. 5-8). Connect one test lead to

generator field coil housing, and touch other test lead in succession to both main armature leads, field lead, and equalizer lead. If lamp lights on any one or more of these tests, coil insulation is defective; replace housing assembly.

f. Bearing and Brush Holder Support Assembly.

(1) Visually inspect for cracks and distortion of brush holder assemblies. Replace holder assembly that shows either of these defects.

(2) Do not disassemble support assembly when all parts appear to be in good condition, with brush holders tight on the brush holder support.

g. Cooling Fan. Check cooling fan for broken vanes, broken hub, and damaged keyways. Replace fan that shows any of these defects.

h. Fan Cover Assembly. Inspect cover assembly for deep chips, cracks, and distortions. Replace cover that shows any of these defects.

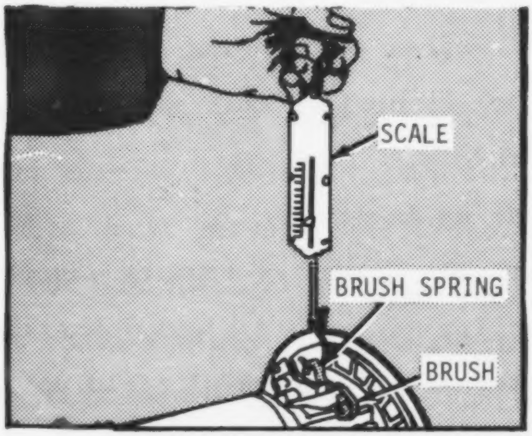

Figure 5-10. Testing brush spring tension.

5-23. Repair.

a. General. The armature and housing assembly are the only two components repaired by restoring them to serviceable condition. All other components and repair parts are replaced when inspection indicates unserviceable condition.

b. Resurfacing Commutator.

(1) Install commutator end bearing on armature and mount in lathe with armature turning center in place on bearing (fig. 5-13). Do not mount armature in shaft centers.

(2) Measure diameter of commutator to make certain it can be safely turned to minimum diameter of 3.220 inches. Do not attempt to refinish commutator reduced by previous resurfacing to less than 3.220 inches.

(3) Secure and sharpen cutting tool for commutator work (fig. 5-11). Position cutting tool against commutator as shown in figure 5-12. Make certain tool is sharpened by final honing with hard, fine stone.

(4) Take light cut across entire surface of commutator with armature rotating between 600 and 800 rpm (fig. 5-13). If commutator is not severely worn or pitted, first cut should renew the entire surface. If commutator is badly worn, take additional cuts until entire surface is renewed. Carry each cut across entire surface without stopping, and remove no more than 0.005 inch of material in any one cut.

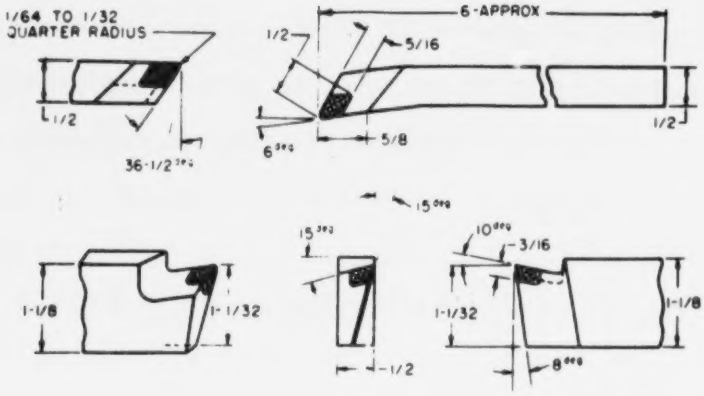
1/64 TO 1/32
QUARTER RADIUS
1/2
36-1/2 deg
6-APPROX
1/2
5/16
5/8
6 deg
1/2
15 deg
15 deg
10 deg
3/16
1-1/8
1-1/32
1/2
1-1/32
1-1/8
8 deg

Figure 5-11. Lathe tool properly shaped for commutator turning.

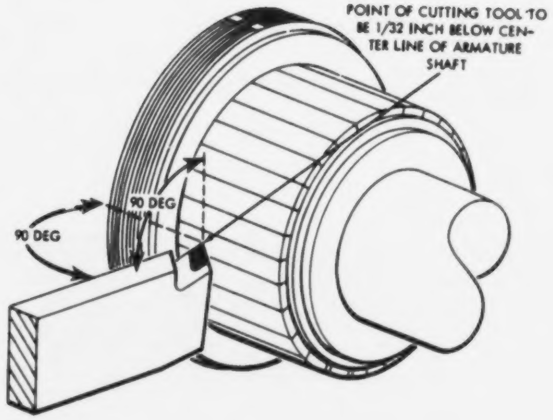
POINT OF CUTTING TOOL TO BE 1/32 INCH BELOW CENTER LINE OF ARMATURE SHAFT
90 DEG
90 DEG

Figure 5-12. Position of cutting tool to commutator.

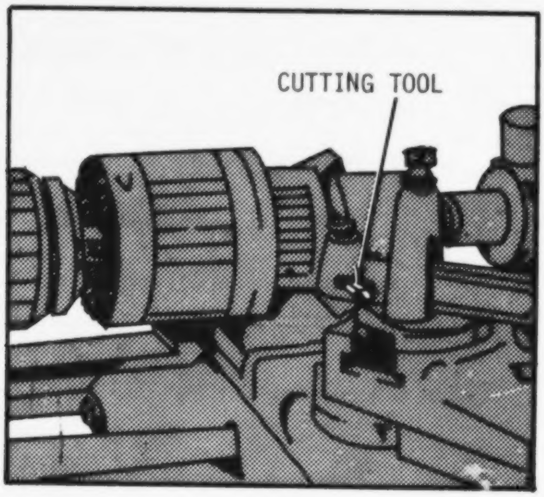
CUTTING TOOL

Figure 5-13. Armature mounted in lathe.

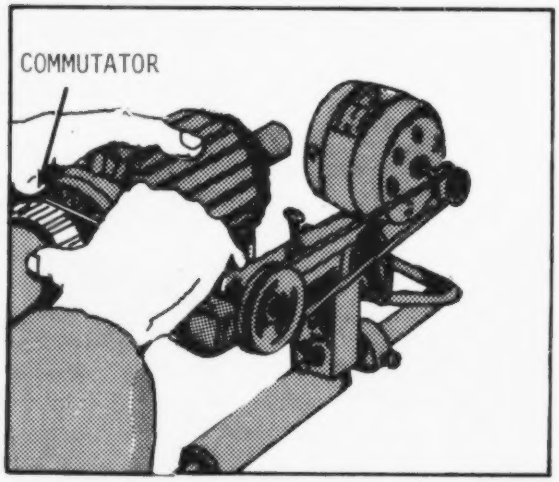
COMMUTATOR

Figure 5-14. Undercutting mica between commutator bars.

c. Undercutting Mica.

(1) After commutator surface has been renewed, measure depth of mica below surface. If this depth is less than 0.025 inch, undercut mica with power-driven, mica undercutting tool, using cutter that will produce groove 0.052 inch wide. Cut to a depth of 0.032 inch deep (fig. 5-14).

(2) After undercutting, remove carbon and mica particles with compressed air. Remove burrs left by undercutting: hold strip of 5/0 sandpaper against commutator while armature rotates in lathe at approximately 2,000 rpm (fig. 5-15).

(3) Set up dial indicator gage, and measure accuracy of finished commutator. The total indicated runout shall not exceed 0.001 inch, and variations between any two adjacent commutator bars shall not exceed 0.0002 inch.

d. Repairing Varnished Surfaces of Housing Assembly and Armature Coils.

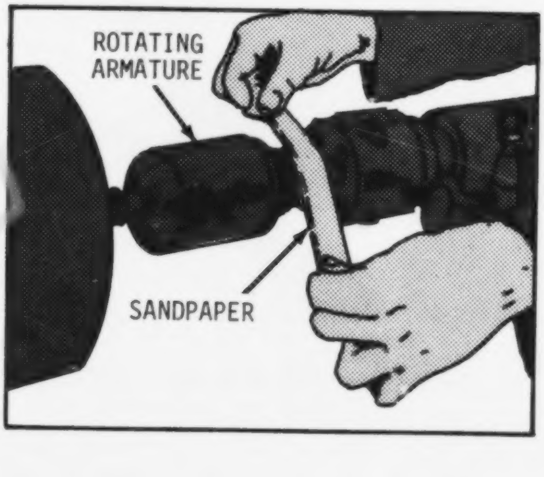

Figure 5-15. Polishing commutator surface.

(1) If insulating compound on outer surface of coils is dry, cracked, or chipped, apply coat of insulating varnish and dry until tacky.

(2) Add as many additional coats as necessary to protect surface. Dry each coat until tacky before applying next coat.

(3) Place housing assembly or armature in over and bake for 2 hours at 193°F (89.5°C).

(4) After baking armature or housing assembly, perform test series outlined in paragraphs 5-22b or 5-22e.

5-24. Assembly (fig. 5-7).

NOTE

Make certain scribe marks, placed on components at disassembly, aline when assembling fan cover (25), bearing and brush support (18), brush cover band (15), and generator housing (14).

a. Position armature baffle (49) and bearing (50) to shaft of armature (28), and press bearing on shaft.

b. Install snap ring (38) on shaft of armature.

c. Position commutator-end ball bearing (26) to bearing and brush support (18), and press bearing in support.

d. Position 6 brush holders (39) with 12 tubes (40) to support and secure with 12 insulating washers (41), flat washers (42), and nuts (43).

e. Position support baffle (27) and support to armature, and install key (48).

f. Install six brush assemblies (17) in support.

g. Install armature with support in generator housing (14).

h. Connect brush assemblies to generator brush terminals (37) with six screws (16).

i. Position brush support retainer (44) to support on armature and secure with six screws (19) and new lockwire (20) between each two screws.

j. Position fan (21) and fan washer (45) to support and secure to shaft or armature with fan inner nut (46) and fan outer nut (47).

k. Position fan cover (25) to generator housing and secure with 12 washers (22), screws (23), and new lockwire (24) between each two screws.

l. Install brush cover band (15) on generator housing.

m. Position ground strap (32) to inside of radio-noise suppression filter housing (13) and secure with screw (33), three washers (5), and two nuts (4).

n. Position one-pole capacitor (31) to filter housing and secure with two screws (11).

o. Position two-pole capacitor (3) to filter housing and secure with two screws (11).

p. Position filter housing to generator housing and secure with four washers (12) and screws (10).

q. Connect ground strap (32) and one-pole capacitor (31) to generator terminals (34) with two screws (6), washers (29), and nuts (30).

r. Connect circuit A lead (35) and circuit D lead (36) to two-pole capacitor (3) with two washers (2) and nuts (1).

s. Secure filter housing cover (7) to housing (13) with eight washers (8) and screws (9).

5-25. Run-In of Generator Brush (fig. 5-16).

a. Mount generator in test stand or on bench, making certain generator is well secured.

b. Connect single-pole (single-throw switch with current-carrying capacity in excess of 3000 amperes to positive (+) terminal of 28-volt dc power source.

c. Connect in parallel from other side of switch a resistor with 0.1-ohm, 400-ampere rating and a rheostat with minimum rating of 10 ohms, 15 amperes.

d. Connect rheostat to terminal A of generator.

e. Connect resistor to terminal B of generator.

f. Connect negative terminal of 28-volt dc power source to terminal E of generator.

g. Rotate rheostat to minimum resistance reading, and close switch to energize generator. Generator should start and run as a motor in normal direction of rotation, counterclockwise when facing drive end. If rotation is clockwise, check connection from power source: two connections are reversed.

h. Adjust rheostat until armature develops speed of approximately 4,000 rpm.

i. Run generator for 3 hours to polish brush seats on commutator. After run-in remove one brush assembly at a time, and inspect brush contact surface. Each brush should show polished seating area of 90 percent in axial direction and 100 percent in rotational direction (fig. 5-17). If brushes are not properly seated, continue run-in until properly seated, making brush inspection periodically.

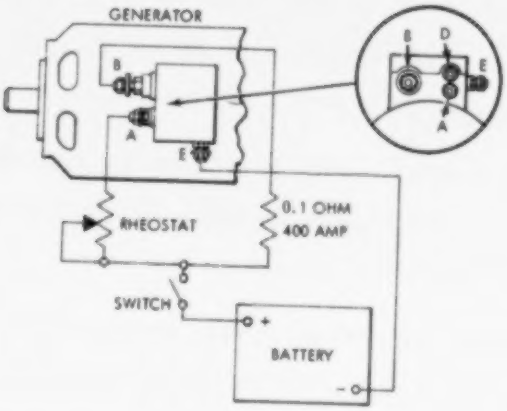
GENERATOR
B
A
E
B
D
E
A
RHEOSTAT
0.1 OHM
400 AMP
SWITCH
+
BATTERY
-

Figure 5-16. Electrical test setup for brush run-in.

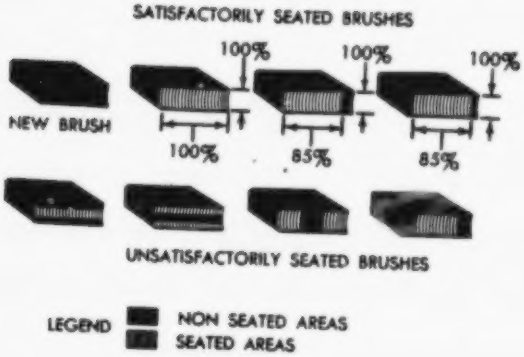
SATISFACTORILY SEATED BRUSHES
100%
100%
100%
NEW BRUSH
100%
85%
85%
UNSATISFACTORILY SEATED BRUSHES
LEGEND
NON SEATED AREAS
SEATED AREAS

Figure 5-17. Proper brush seating.

5-26. Starter-Generator Repair and Overhaul Standards.

Refer to table 5-4 and figure 5-18 for repair and overhaul standards. The repair and overhaul standards give minimum, maximum, and key clearances of new or rebuilt parts. They also give wear limits which indicate that point to which a part or parts may be worn before replacement in order to get maximum service with minimum replacement.

Normally, all parts which have not been worn beyond the wear limits, dimensions, or damaged from corrosion will be approved for service. The explanation of the columns as shown in table 5-4 is as follows:

a. The Figure Number column lists the number of the figure illustrating the points of measurement for each fit or limit.

b. The Reference Letter column lists the callout letters within the figure designating the point of measurement.

c. The Point of Measurement column defines the area or surface subject to wear.

d. The Sizes and Fits of New Parts column gives minimum-to-maximum size and clearance. The letter L in this column indicates a loose fit (clearance), and the letter T indicates a tight fit (interference).

e. The Wear Limits column gives the maximum wearing permitted before replacing the part(s).

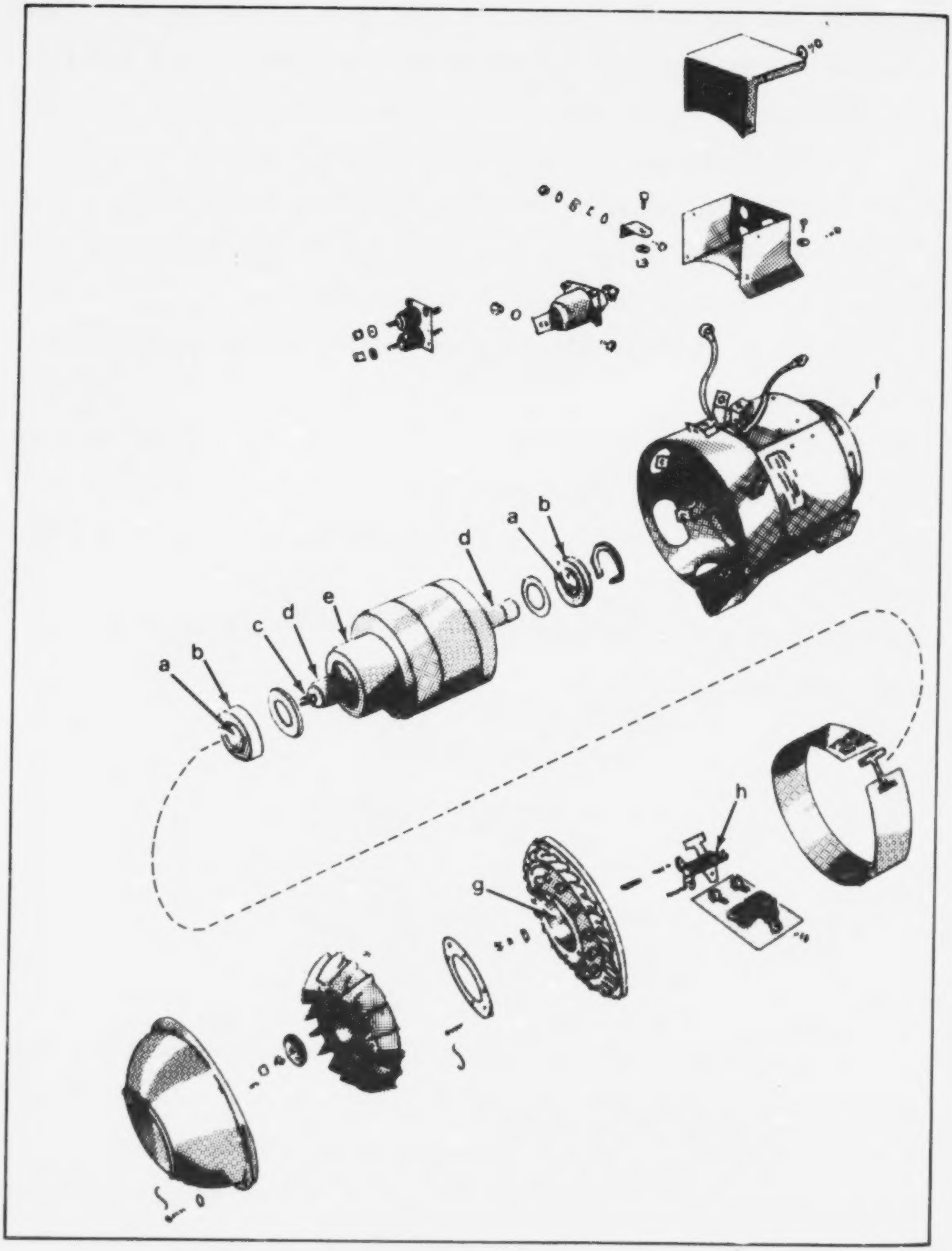
a
b
c
d
e
d
a
b
f
g
h

Figure 5-18. Repair and overhaul standard points of measurement for starter-generator.

Table 5-4. Starter-Generator Repair Standards

Fig. No.	Ref. Letter	Point of measurement	Sizes and fits of new parts	Wear limit field
5-18	a	Inside diameter of commutator bearing	1.1807 to 1.1811	(*)
	d	Diameter of armature shaft journal	1.1810 to 1.1813	(*)
	a-d	Fit of shaft in bearing	0.0001L to 0.0006T	
	b	Outside diameter of commutator bearing	2.4407 to 2.4400	(*)
	f	Inside diameter of housing bore	2.4400 to 1.4409	
	b-f	Fit of bearing in bore	0.0003T to 0.0002L	
	b	Outside diameter of commutator bearing	0.4407 to 2.4409	(*)
	g	Inside diameter of support bore	2.4406 to 2.4409	(*)
	c	End play of armature	0.0004 to 0.0009	(*)
	h	Brush spring tension (measured at new brush position	45 oz to 54 oz	(*)
	j	Brush wear length		to wear groove in side of brush
	e	Diameter of commutator	3.3050 to 3.3190	3.220

Section VIII. GENERATOR-REGULATOR MAINTENANCE PROCEDURES

5-27. General.

a. Scope. This section contains instructions for removal, disassembly, inspection and repair, assembly and installation of the generator regulator in generator sets, serial numbers 923-001 thru 923-553. For generator sets, serial numbers 929-001 thru 929-290, the regulator is non-repairable so only the paragraphs on removal and installation are applicable, as will be noted below. Also, this section covers the removal, inspection and installation of the generator regulator resilient mounts.

b. Description. The generator regulator (generator sets, serial numbers 923-001 thru 923-553) consists of a relay assembly and voltage regulator assembly bound in a watertight case. The generator regulator in generator sets, serial numbers 929-001 thru 929-290 is a single assembly in a sealed case. For both regulators, connection is made to integral parts of the case through a pin-type connector and a socket-type connection mounted on top of the case.

5-28. Removal. (Fig. 5-19).

a. Make certain all power is turned OFF.

b. Disconnect wiring harness (1) at regulator battery connector (2) and regulator generator connector (12).

c. Remove screw (3), and disconnect ground leads (4) at top of regulator (9).

d. Remove four screws (5) and eight washers (8) securing regulator ground lead (6) and regulator to mounts (13) on inner frame (14).

e. Disconnect ground lead (6), and remove regulator from mounts.

f. If replacement regulator (generator sets, serial numbers 923-001 thru 923-553) is to be installed, remove four brackets (7) from defective regulator.

f.1. If replacement regulator (generator sets, serial numbers 929-001 thru 929-290) is to be installed, remove two brackets (7) from defective regulator.

5-29. Disassembly. (Serial numbers 923-001 thru 923-553 only). (Fig. 5-20).

a. Remove wire seal (2), six screws (3), and lockwashers (4), and remove regulator cover (1) and gasket (5) from case (13). Discard wire seal and gasket.

b. Remove two nuts (8), lockwashers (9), and flat washers (10), and disconnect two bus bars (11) from relay assembly (6).

c. Remove screw (27), lockwasher (28), and flat washers (29), and disconnect clamp (30) and cable assemblies (16) from relay assembly (6) and voltage regulator assembly (22).

d. Remove wire seal (20), six screws (19), and lockwashers (18), and remove base plate (21) with relay assembly (6), voltage regulator assembly (22), and gasket (25) from case (13). Discard wire seal and gasket.

e. Remove four screws (12) and remove two bus bars (11) from inside of case.

f. Remove eight screws (17) and remove two cable assemblies (16) and gaskets (26) from case. Discard gaskets.

g. Remove six screws (7) and remove relay assembly from base plate (21).

h. Remove bolt (24) and washer (23) and remove voltage regulator assembly from base plate.

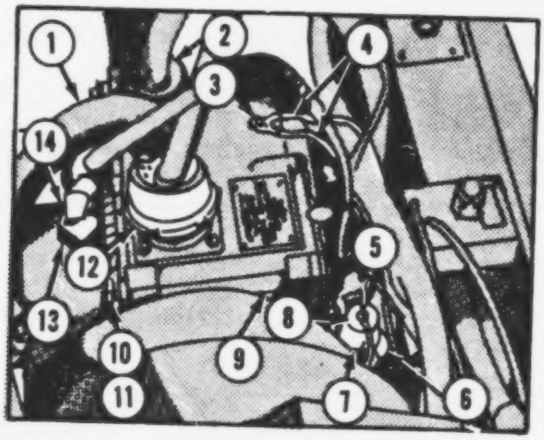

Figure 5-19. Generator regulator removal points.

Legend for figure 5-19.

1 - Wiring harness

2 - Regulator battery connector

3 - Ground lead screw

4 - Generator and relay ground lead

5 - Regulator mounting screw

6 - Regulator ground lead

7 - Regulator mounting bracket

8 - Regulator mounting washer

9 - Generator regulator

10 - Mounting bracket screw

11 - Mounting bracket washer

12 - Regulator generator connector

13 - Regulator resilient mount

14 - Inner frame

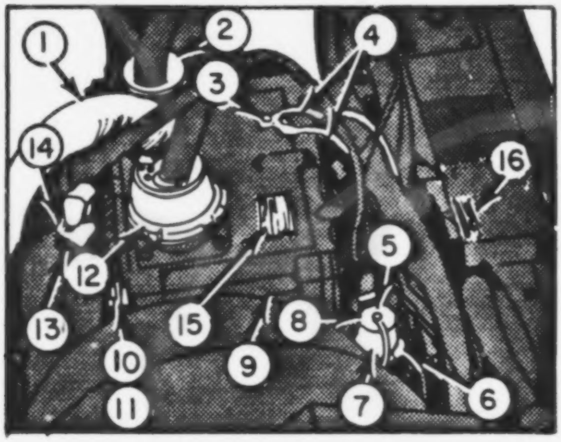

Figure 5-19.1 Regulator removal points.

Legend for figure 5-19.1

1 - Wiring harness

2 - Regulator battery connector

3 - Ground lead screw

4 - Generator and relay ground lead

5 - Regulator mounting screw

6 - Regulator ground lead

7 - Regulator mounting bracket

8 - Regulator mounting washer

9 - Generator regulator

10 - Mounting bracket screw

11 - Mounting bracket washer

12 - Regulator generator connector

13 - Regulator resilient mount

14 - Inner frame

15 - Reset button

16 - Decal

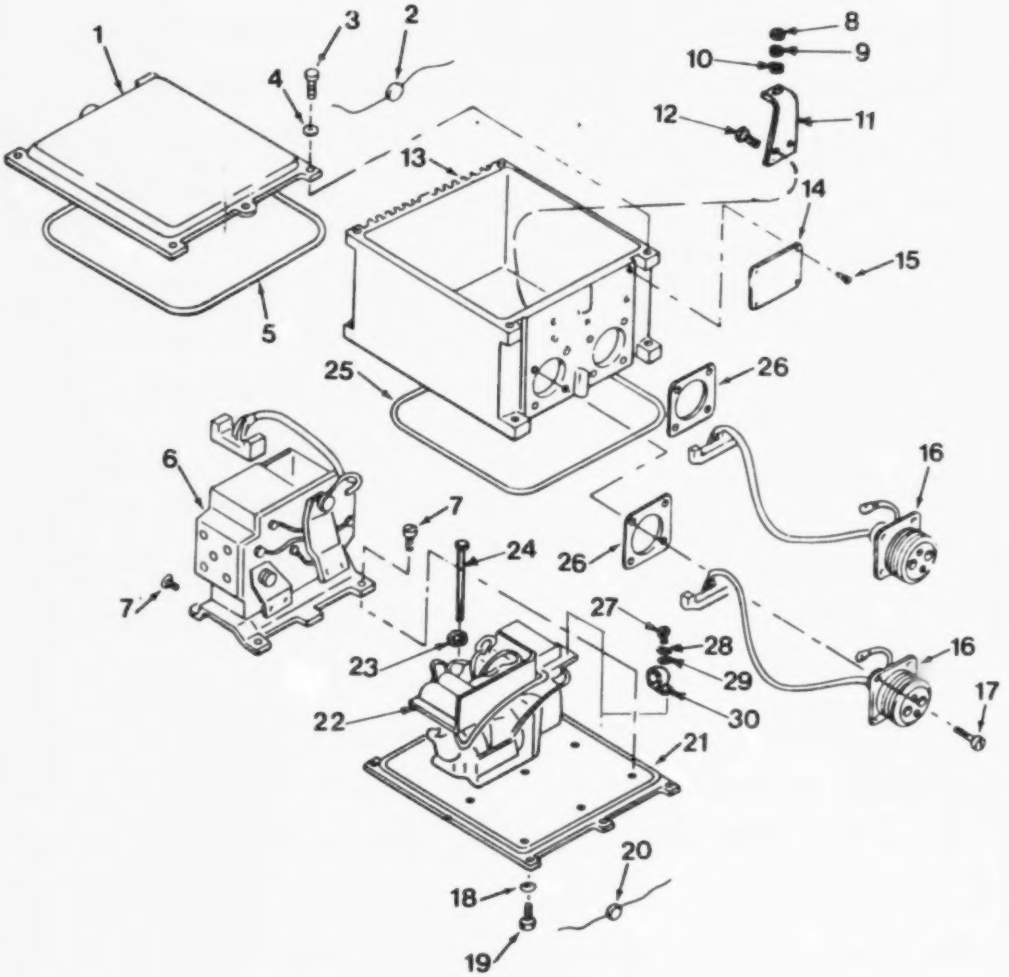
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Figure 5-20. Generator-regulator — exploded view.

Legend for figure 5-20.

1 - Regulator cover
2 - Cover wire seal
3 - Cover screw
4 - Cover lockwasher
5 - Cover gasket
6 - Relay assembly
7 - Relay screw
8 - Bus bar nut
9 - Bus bar lockwasher
10 - Bus bar flat washer
11 - Bus bar
12 - Bus bar screw
13 - Regulator case
14 - Identification plate
15 - Identification plate drive screw
16 - Receptacle cable assembly
17 - Receptacle screw
18 - Base plate lockwasher
19 - Base plate screw
20 - Base plate wire seal
21 - Regulator base plate
22 - Voltage regulator assembly
23 - Voltage regulator mounting washer
24 - Voltage regulator bolt
25 - Base plate gasket
26 - Receptacle gasket
27 - Clamp screw
28 - Clamp lockwasher
29 - Clamp flat washer
30 - Cable clamp

Table 5-5. Generator Regulator Circuit Values

Component	Circuit	Resistance (OHMS)
Relay Assembly	PS-18 and 19 to case	Over 500
	PS-16 to case	Infinite
	PS-12 to case	2
	PS-11 to case	100 to 150
Voltage regulator assembly (Generator set, serial numbers 923-001 thru 923-553)	CR-2 to CR-18	Less than 1
	CR-18 to case	45 to 50
	CR-18 to CR-5	10 to 15

5-30. Inspection and Repair. (Serial numbers 923-001 thru 923-553 Only).

a. Inspection.

(1) Inspect voltage regulator assembly for electrical continuity as described in electrical troubleshooting (para. 4-9). Replace regulator assembly if defective.

(2) Check external connectors for evidence of damage to threads, pins, and sockets. Replace connectors if damaged.

(3) Inspect cover, case, and base plate for deep dents and distortion of surfaces. Replace components that show either of these defects.

(4) Check relay assembly, voltage regulator assembly, and cable assemblies for burned, worn or frayed insulation. Replace components that show any one of these defects.

(5) Inspect screws and threaded parts for crossed, worn, or damaged threads. Replace parts if damage is beyond repair.

b. Repair. Repair of the generator components consists of replacing parts that do not pass visual inspection and have not retained proper electrical characteristics. Refer to figure 4-2 for electrical schematic diagram of generator regulator and table 5-5 for circuit values of points on plug strip (PS) and connector block (CR).

5-31. Assembly (fig. 5-20).

a. Position voltage regulator assembly (22) to base plate (21) and secure with bolt (24) and washer (23).

b. Position relay assembly (6) to base plate and secure with six screws (7).

c. Install two new gaskets (26) and cable assemblies (16) in regulator case (13) and secure with eight screws (17).

d. Position two bus bars (11) inside case and secure with four screws (12).

e. Position new gasket (25) and base plate with regulator and relay assemblies to case and secure with six lockwashers (18), screws (19), and new wire seal (20).

f. Position clamp (30) with cable assemblies (16) to regulator and relay assemblies and secure with flat washer (29), lockwasher (28), screw (27).

g. Connect bus bars to relay with flat washers (10), lockwashers (9), and nuts (8).

h. Position new gasket (5) and cover (1) to case and secure with six lockwashers (4), screws (3), and new wire seal (2).

5-32. Installation (fig. 5-19 or 5-19.1).

a. If new generator regulator (9) is to be installed (generator sets, serial numbers 923-001 thru 923-553), reinstall four brackets (7) on new regulator.

a.1. If new generator regulator (8) is to be installed (serial numbers 929-001 thru 929-290), reinstall two brackets (7) on new regulator.

b. Position regulator to mounts (13) on inner frame (14).

c. Position regulator ground lead (6) to regulator, and secure lead and regulator to mounts with eight washers (8) and four screws (5).

d. Connect ground leads (4) to regulator with screw (3).

e. Connect wiring harness (1) to regulator battery connector (2) and regulator generator connector (12).

5-33. Generator Regulator Resilient Mounts (fig. 5-21).

NOTE

The four resilient mounts are removed and installed in a similar manner. Do not remove or install more than one mount at a time.

a. Removal.

(1) Make certain all power is turned OFF.

(2) Remove screws and three washers securing regulator to inner frame.

(3) Loosen three mount screws so that regulator can be moved to either side.

(4) Remove two screws securing resilient mount to inner frame.

(5) Support regulator, and remove mount.

NOTE

The left rear mount screw also secures the regulator ground lead.

b. Inspection and Repair. Inspect resilient mounts for cracks, wear, and loss of resiliency. Replace mounts that show any one of these defects.

c. Installation.

(1) Position resilient mount between regulator support and inner frame.

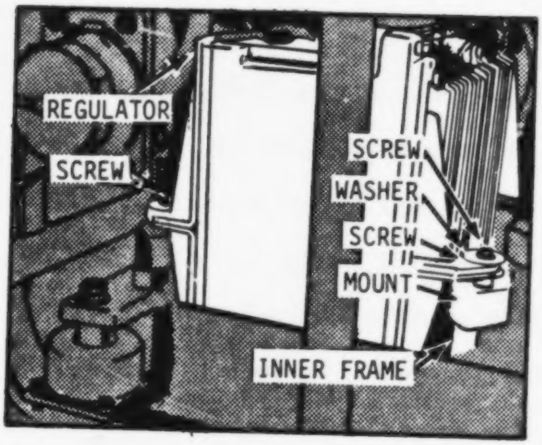

Figure 5-21. Generator regulator resilient mounts.

(2) Secure mount to frame with two screws.

(3) Secure regulator to frame with three washers and screw.

NOTE

If left rear mount is removed, also install regulator ground lead.

(4) Tighten three mount screws securing other regulator mountings.

Section IX. PREPARATION FOR SHIPMENT AND STORAGE

5-34. General.

This chapter contains instructions for shipping, storage, and loading of the generator set.

5-35. Shipping Instructions.

a. Preparation for Shipment. When shipping the generator set, the officer in charge of preparing the shipment will be responsible for furnishing materiel in a serviceable condition, properly cleaned, processed, and packaged.

b. Removal of Preservatives Prior to Shipment. Personnel withdrawing the generator set from storage for shipment must not remove preservatives other than to insure that the materiel is complete and serviceable. If preservatives have been removed, they must be restored to the prescribed level prior to shipment.

NOTE

Removal of preservatives is the responsibility of the organization receiving the shipment.

c. Army Shipping Documents. Prepare all army shipping documents in accordance with AR 725-50.

5-36. Storage Instructions.

a. General.

(1) The generator set received for storage and already processed for shipment, as indicated in DD form 1397, must not be reprocessed, unless inspection performed on receipt of materiel reveals corrosion, deterioration, etc.

(2) Completely process the generator set upon receipt directly from manufacturing facilities or if the processing data on the tag indicates that preservatives have been rendered ineffective by freight shipping damage.

(3) The generator set to be prepared for storage must be given a limited technical inspection and processed as prescribed in TB 9-299/1. The results of the inspection and classification will be entered on DA Form 2404 (Equipment Inspection and Maintenance Worksheet).

b. Inspection upon Receipt.

(1) Immediately upon receipt of the generator set for storage, it must be inspected and serviced as prescribed in paragraphs 2-11, 2-12, and 4-6, 4-7. Perform a systematic inspection and replace or repair all missing or broken parts. If repairs are beyond the scope of the unit and materiel will be inactivated for an appreciable length of time, place materiel in storage and attach tags specifying the repairs needed. The reports of these conditions will be submitted by the unit commander for action by a supporting maintenance unit.

(2) When materiel is inactivated, it will be processed in accordance with TB 9-299/1.

(3) Prepare a DD Form 6 (Report of Packaging and Handling Deficiencies) for all shipments received in a damaged or otherwise unsatisfactory condition, due to deficiencies in preservation, packaging, loading, or storage and for apparently excessive preservation.

c. Storage Site. The preferred storage site for the generator set is under a cover in dry, covered sheds. When it is necessary to store materiel outdoors, protect it against the elements.

d. Inspection During Storage. Perform a visual inspection periodically to determine general condition. If corrosion is found, remove it and clean, paint, and treat the set with prescribed preservatives.

NOTE

Touchup painting will be in accordance with TM 43-0139, Painting Instructions for Field Use.

e. Removal from Storage.

(1) If the generator set is not shipped or issued upon expiration of the storage period, process as applicable in accordance with TB 9-299/1.

(2) If the generator set to be shipped will reach its destination within the storage period, it need not be reprocessed upon removal from storage, unless inspection reveals reprocessing to be necessary because of anticipated intransit weather conditions.

(3) If the generator set is to be placed into immediate service, deprocess it in accordance with TB 9-299/1. Inspect and service it as prescribed in paragraphs 2-11, 2-12, and 4-6, 4-7.

5-37. Packaging. See figure 2-8.

5-38. Army Shipping Documents.

Prepare all Army shipping documents accompanying freight in accordance with AR 725-50.

APPENDIX A

REFERENCES

A-1. FIRE PROTECTION AND SAFETY

TB 5-4200-200-10	Hand Portable Fire Extinquishers Approved for Army Use.
TB MED-251	Noise and Conservation of Hearing.

A-2. LUBRICATION

C9100-IL	Petroleum, Petroleum Base Products and Related Materials.
LO 5-2805-203-12	Lubrication Order - Engine, Gasoline: 6HP; Military Standard DOD Model 4A032-1 and Model 4A032-2.

A-3. PAINTING

TM 43-0139	Painting Instructions for Field Use

A-4. CLEANING

C6800IL	Chemicals and Chemical Products.
TM 38-230-1	Preservation, Packaging, and Packing of Military Supplies and Equipment (Cleaning).

A-5. MAINTENANCE

TM 5-764	Electric Motor and Generator Repair.
DA PAM 738-750	The Army Maintenance Management System (TAMMS).
TM 5-6115-596-24P	Organizational, Direct and General Support Maintenance Repair Parts and Special Tools List: Generator Set, 4.2KW, 150 AMP, 28V, DC, Air Cooled (John R. Hollingsworth Model DC 4.2-ORD/28)
TM 9-6115-541-24&P	Unit, Intermediate Direct Support and Intermediate General Support Maintenance, including Repair Parts and Special List for Auxiliary Power Unit.

A-5. Continued

TM 5-2805-203-14	Operator, Organizationa. Intermediate (Field) (Direct Support and General Support, and Depot Level Maintenance Manual: Engine, Gasoline, 6 HP, Military Standard Models, DOD 4A032-1 and DOD Model 4A032-1.
TM 740-90-1	Administrative Storage of Equipment
TB 740-97-2	Preservation of USAMECOM Mechanical Equipment for Shipment and Storage.
TM 9-6140-200-14	Operator's, Organizational, DS and GS Support Maintenance Manual for Lead-Acid Storage Batteries.

A-6. DEMOLITION

TM 750-244-3	Procedures for Destruction of Equipment to Prevent Enemy Use.

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. General.

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the special tools and test equipment required for each maintenance function as referenced from Section II. (Not Used).

d. Section IV contains supplemental instructions on explanatory notes for a particular maintenance function. (Not Used).

B-2. Maintenance Functions.

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, or replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), and item, or system.

j. Overhaul. That maintenance effort (services/actions) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipments/components.

B-3. Column Entries Used in the MAC.

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see paragraph B-2.)

d. Column 4, Maintenance Level. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform the maintenance function at the indicated level of maintenance. If the number of complexity of the tasks within the listed maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate work time figures will be shown for each level. The number of man-hours specified by the work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance levels are as follows:

C	Operator or crew
O	Organization maintenance
F	Direct support maintenance
H	General support maintenance
D	Depot maintenance

e. Column 5, Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function. (Not Used).

f. Column 6, Remarks. This column shall contain a letter code in alphabetical order which shall be keyed to the remarks contained in Section IV. (Not Used).

B-4. Column Entries Used in Tool and Test Equipment Requirements. (Not Used).

a. Column 1, Tool or Test Equipment Reference Code. The tool and test equipment reference code correlates with a maintenance function on the identified end item or component.

b. Column 2, Maintenance Level. The lowest level of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4, National/NATO Stock Number. The National or NATO stock number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturer's part number.

B-5. Explanation of Columns in Section IV. (Not Used).

a. Reference Code. The code scheme recorded in column 6, Section II.

b. Remarks. This column lists information pertinent to the maintenance function being performed as indicated on the MAC, Section II.

Section II. MAINTENANCE ALLOCATION CHART

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Level C	O	F	H	D	(5) Tools and equipment	(6) Remarks
1	Cover	Inspect	0.1						
		Repair		0.5					
		Replace		0.1					
2	Lines, Fittings and Hoses	Inspect	0.1						
		Replace		0.2					
3	Muffler and Pipes	Inspect		0.1					
		Replace		0.3					
4	Wiring Harness	Inspect	0.1						
		Test		0.3					
		Repair		0.4					
		Replace		0.7					
5	Receptacles	Inspect		0.1					
		Test		0.1					
		Replace		0.3					
6	Filter, Fuel	Inspect	0.1						
		Service	0.2						
		Repair		0.1					
		Replace		0.2					
7	Belts, Drive	Inspect	0.1						
		Adjust		0.2					
		Replace		0.4					
8	Generator Controls Panel								
	Switches	Test		0.1					
		Replace		0.1					
	Rheostats	Test		0.1					
		Replace		0.1					
	Relays	Inspect		0.1					
		Test		0.2					
		Replace		0.4					
9	Voltage Regulator Generator	Inspect			0.1				
		Test			0.3				
		Repair				1.0			
		Replace			0.3				
10	Regulator, Battery Charging	Test		0.2					
		Replace		0.2					

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and equip-ment	(6) Remarks
			C	O	F	H	D		
11	Fuel Tank	Inspect	0.1						
		Test			0.5				
		Repair			2.0				
		Replace			0.5				
		Service		0.1					
12	Generator, Starter	Inspect			0.1				
		Test			0.8				
		Repair			0.5				
		Replace			0.5				
	Brushes	Inspect			0.2				
		Replace			0.7				
	Armature	Inspect			0.1				
		Test			0.3				
		Repair			0.5				
		Replace			0.6				
	Stator Assy	Inspect			0.6				
		Test			0.2				
		Replace			0.6				
	Bearings	Inspect			0.1				
		Replace			0.3				
	Capacitors	Test			0.1				
		Replace			0.2				
13	Engine Assy	Inspect	0.2						
		Test			1.0				
		Repair				16.0			
		Replace			1.3				
		Service	0.6						
14	Generator Set Frame	Inspect		0.1					
		Repair			0.5				
		Replace			0.2				

APPENDIX C

ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

C-1. SCOPE.

This appendix lists additional items you are authorized for the support of the Generator Set.

C-2. GENERAL.

This list identifies items that do not have to accompany the Generator Set and that do not have to be turned in with it. These items are authorized to you by CTA, MTOE, TDA or JTA.

C-3. EXPLANATION OF LISTING.

National stock number, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. "USEABLE ON" codes are identified as follows:

CODE	USED ON

(NOT APPLICABLE)

Section II. ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION PART NUMBER & FSCM USEABLE ON CODE	(3) U/M	(4) QTY AUTH
2910-00-066-1235	ADAPTER, FUEL DRUM	EA	1
7510-00-889-3494	BINDER, LOOSE LEAF, U.S. ARMY EQUIPMENT LOG BOOK	EA	1
7520-00-559-9618	CASE, MAINTENANCE AND OPERATOR'S MANUALS	EA	1
4210-00-555-8837	EXTINQUISHER, FIRE	EA	1
4720-00-021-3320	HOSE, FUEL, AUXILIARY	EA	1

APPENDIX D

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

D-1. SCOPE.

This appendix lists expendable supplies and materials you will need to operate and maintain the Generator Set. These items are authorized to you by CTA50-970, Expendable Items (except Medical, Class V, Repair Parts, and Heraldic Items).

D-2. EXPLANATION OF COLUMNS.

a. Column 1 - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, Item 5 App. D").

b. Column 2 - Level. This column identifies the lowest level of maintenance that requires the listed item. (enter as applicable):

C - Operator/Crew	F - Direct Support Maintenance
O - Organizational Maintenance	H - General Support Maintenance

c. Column 3 - National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column 4 - Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by the Federal Supply Code for Manufacturer (FSCM) in parenthesis, if applicable.

e. Column 5 - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	O	9150-00-190-0905	GREASE, ALL PURPOSE MIL-G-10924	LB
2	C	9130-00-160-1817	GASOLINE, AUTOMOTIVE	GAL
3	C	6850-00-281-1985	CLEANING SOLVENT P-D-680	GAL
4	C	9150-00-265-9433	OIL, LUBRICATING OE30	QT
5	C	9150-00-265-9425	OIL, LUBRICATING OE10	QT
6	C	9150-00-265-7602	OIL, LUBRICATING OES	QT

APPENDIX E

TORQUE LIMITS

Torque values are given in inch pounds (in. lbs.), foot pounds (ft. lbs.), and kilogram meter (kg. m.).

Engine	Inch-Pounds	Foot Pounds	Kilogram Meters
Exhaust manifold to cylinder head nuts	60-65		(10716-11609 cm)
Cylinder head nuts		11-13	(1.5213-1.7979)
Rocker arm lock nuts	4-5		(0.5532-0.6915)
Spark plugs	23-25		(3.1809-3.4575)
Oil filter shell screw	5.8-6.7		(0.8021-0.9266)
Center main bearing screw	4-5		(0.5532-0.6915)
Connecting rod screws	8-9		(1.1064-1.2447)
Fly wheel bolts	37-40		(5.1171-5.532)
Oil pan screws	4-5		(0.5532-0.6915)
Starting rope pulley screws	9-10		(1.2447-1.383)
Exhaust end cover and exhaust mtg. screws	45-50		(8037-8930 cm)

Paragraphs

- Air-shutter lever (See Lever, air shutter)
- Appendices:
  - Additional Authorization List (C) C-1
  - Expendable Supplies and Material List (D) D-1
  - Maintenance Allocation Chart (B) B-1
  - References (A) A-1
  - Torque Limits (E) E-1
- Army shipping documents (See shipping documents, Army)

- Before-operation services 2-14
- Belt drive:
  - Adjustment 4-23A
  - Inspection and repair 4-23C
  - Installation 4-23D
  - Removal 4-23B

- Cap, fuel tank 2-9
- Control panel (See Panel, control)

- Data, equipment 1-7
- Drive belt (See Belt, drive)

- Electrical receptacle (See Receptacle, electrical)
- Electrical troubleshooting (See Troubleshooting, electrical)
- Engine:
  - Description 1-6A
  - Drive sheave and adapter, engine belt 5-11
  - Inspection after installation 5-10C
  - Installation 5-10B
  - Removal 5-10A
  - Starting 2-14B
  - Stopping 2-14F
- Engine start switch (See Switch, engine start)
- Engine stop-run switch (See switch, engine stop-run)

- Filter, fuel:
  - Inspection and repair 4-17B
  - Installation 4-17C
  - Removal 4-17A
- Flanged manifolds (see Manifolds, flanged)
- Forms, records and reports 1-2
  - Failure from subjection to weather extremes 2-15C
  - Notice of discrepancy, recommended change 1-3
  - Shipping documents, Army 5-38
- Fuel, air intake and exhaust system (Also see specific items) 4-14
- Fuel-filter (See Filter, fuel)
- Fuel hoses (See Hoses, fuel)
- Fuel shutoff valve (See Valve, fuel shutoff)
- Fuel System:
  - Description 1-6D
  - Lubrication 3-1
- Fuel tank (See Tank, fuel)

INDEX (Continued)

Paragraph

Fuel tank cap (See Cap, fuel tank)

Generator Regulator (See Regulator, generator)
Generator set:
  Description (Also see specific items) 1-5
  End Item application 1-1
Generator, starter:
  Applying generator load 2-14D
  Assembly 5-24
  Cleaning 5-21
  Description 1-6B
  Disassembly 5-20
  Drive sheave and bushing, starter-generator belt 5-19
  Inspection and repair 5-18B, 5-22, 5-23
  Installation 5-18C
  Removal 5-18A
  Voltage adjustment 5-17
Generator-to-regulator wiring harness (See Harness, wiring generator-to-regulator)

Hand receipts 1-4
Harness, wiring, generator-to-regulator 4-35
Harness, wiring, power receptacle 4-36
Harnesses and cables, wiring 4-32
Hoses, Fuel:
  Inspection and repair 4-18B
  Installation 4-18C
  Removal 4-18A

Identification plates and signes (See Plates, identification)
Inner frame resilient mounts (See Mounts, inner frame resilient)

Lever, air shutter 2-4
Lever, engine choke control 2-5
Lubrication 3-1

Maintenance in unusual conditions (See Unusual conditions, maintenance)
Manifolds, flanged:
  Inspection and repair 4-21B
  Installation 4-21C
  Removal 4-21A
Mounts, resilient, generator regulator:
  Inspection and repair 5-33B
  Installation 5-33C
  Removal 5-33A
Meter, Time totalizing 1-6F

INDEX (Continued)

Paragraph

Mounts, resilient, inner frame:
  Inspection and repair 4-13B
  Installation 4-13C
  Removal 4-13A
Mufflers:
  Inspection and repair 4-20B
  Installation 4-20C
  Removal 4-20

Operating precautions 2-14E
Operation in unusual conditions (See Unusual conditions, operation)

Panel, control·
  Assembly 4-30
  Description 1-6E
  Disassembly 4-27
  Inspection and repair 4-29
  Installation 4-31
  Removal 4-26
Parts, tools, and equipment
  Common tools and equipment 4-3
  Repair parts 4-2, 5-2
  Special tools and equipment 4-4, 5-3
Plates, identification 1-7
Power receptacle wiring harness (See Harness, wiring power receptacle)
Preventive-maintenance:
  Daily preventive-maintenance services 2-12
  Frequency 2-11C
  Quarterly services, general procedures 4-6
  Quarterly services, specific procedures 4-7

Receptacle, electrical 2-10
Regulator, generator:
  Assembly 5-31
  Description 1-6C
  Disassembly 5-29
  Inspection and repair 5-30
  Removal 5-28
  Installation 5-32
Repair parts (See Parts, tools, and equipment)
Rheostat, voltage adjusting 2-8

Service upon receipt of material:
  Break-in services 2-13B
  Correction of deficiencies 2-13D
  General 2-13
  Preliminary services 2-13B
Shipping 5-35
Special tools and equipment (See Parts, tools, and equipment)

INDEX (Continued)

Paragraph

Starter-generator (See Generator, starter)
Starting rope and pulley 2-7
Storage 5-36
Switch, engine start 2-2
Switch, engine stop-run 2-3

Tank, fuel:
  Draining 4-15
  Inspection and repair 4-16
  Installation 5-14
  Removal 5-13
Tools (See Parts, tools and equipment)
Troubleshooting (Also see specific items) 5-8
Troubleshooting, electrical 4-10
Troubleshooting, general 4-8
Troubleshooting, operator 3-5

Unusual conditions, maintenance 2-15
  Extreme cold weather 2-16
  Extreme hot weather or dust 2-17
  Lubrication 3-3
  Lubrication after subjection to water 3-4
  Water, maintenance after subjection to 2-18
Unusual conditions, operation 2-15
  Extreme cold weather 2-16
  Extreme hot weather or dust 2-17
Usual conditions, operation 2-13

Valve, fuel shutoff:
  Description 2-5
  Inspection and repair 4-19B
  Installation 4-19C
  Removal 4-19A
Voltage adjusting rheostat (See Rheostat, voltage adjusting)

Weather extremes, operation and maintenance (See Unusual conditions, operation and Unusual conditions, maintenance)
Wiring harnesses and cables (See Harnesses and cables, wiring)

By Order of the Secretary of the Army:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Major General, United States Army
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To be distributed in accordance with DA Form 12-25D Operator Maintenance Requirements for Generator Sets, Engine Driven.

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TEAR ALONG DOTTED LINE

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

SOMETHING WRONG WITH THIS MANUAL?

THEN. . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM, TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)
PFC JOHN DOE
CO A, 3d ENGINEER BN
FT. LEONARD WOOD MO 63108

DATE

PUBLICATION NUMBER	DATE	TITLE
TM 5-6115-596-14	20 Jun 80	Generator Set: 28V DC

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
6	2-1 a			In line 6 of paragraph 2-1a the manual states the engine has 6 cylinders. The engine on my set only has 4 cylinders. Change the manual to show 4 cylinders.
81		4-3		Callout 16 on figure 4-3 is pointing at a bolt. In the key to fig. 4-3, item 16 is called a shim. Please correct one or the other.
125	line 20			I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered so the NSN is wrong. Please give me a good NSN.

SAMPLE

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
JOHN DOE, PFC (268) 317-7111

SIGN HERE:
John Doe

DA FORM 1 AUG 74 **2028-2** (TEST)

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR MANUAL "FIND," MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

DRSTS-M Overprint 1, 1 Nov 78

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TM 5-6115-596-14	20 June 1980	Gen Set: 28V, DC

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimenter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigrams = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 38.82 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimenter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.365	metric tons	short tons	1.102
pound-inches	newton-meters	.11375			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 045661-000